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BUILDING A SUSTAINABLE FUTURE

**Hampshire and Isle of Wight Air
Ambulance**

Energy Statement

Sustainability Services

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Executive Summary

This Energy Statement has been prepared to demonstrate the measures incorporated into the design at the Hampshire and Isle of Wight Air Ambulance development, which will deliver, lower carbon emissions than a Building Regulations compliant design.

The energy strategy has been developed by following the Energy Hierarchy of 'Lean, Clean, Green'. This statement outlines the proposed energy performance of the site, which will successfully exceed Building Regulations Part L compliance, in line with Eastleigh Borough Council requirements, Policy DM2.

The energy assessment aims to provide an outline energy strategy to meet relevant Planning Policy criteria and meet the requirements of the BREEAM Refurbishment and Fitout criteria outlined within the supporting BREEAM pre-assessment.

Overall, through the implementation of new plant equipment and upgraded building fabric, the proposed development improves upon Building Regulations CO₂ emissions rates by 22.9% over the baseline Building Regulations L2 emissions scenario – exceeding local policy requirements. The implementation of renewed heat pump technology provides a 10.1% reduction of CO₂ emissions over the Lean scenario using LZC technologies (ASHP systems), supporting ongoing energy use and emissions reductions during the buildings operation.

Whilst the implementation of many passive measures on the site are limited due to the re-use of an existing building, the BREEAM Passive design analysis outlines the sustainability measures that will be implemented throughout the site to limit emissions through the optimisation of the building in relation to the site location, proposed layout and local prevailing conditions,

A BREEAM Pre-assessment has also been undertaken to further support this application, which shows that, considering all factors, a 'Very Good' BREEAM certification rating is the most reasonable approach to the site, considering the work proposed.

Overall, the energy use and emissions reduction measures implemented, and the BREEAM measures introduced as part of the wider design represent a positive approach to sustainability throughout the site, which responds positively to policy requirements, whilst carefully considering budgetary and physical constraints of the site.



1.0 Introduction

This Energy Statement has been prepared for Hampshire and Isle of Wight Air Ambulance by Cooper Homewood Limited to demonstrate the energy performance and emissions associated with the proposed refurbishment and re-use of an existing commercial building for use as the new head office for the company.

The statement outlines the buildings overall performance with regards to energy use and emissions and aims to demonstrate that the measures taken on site meet and exceed the required performance standards as outlined within Building Regulations Part L, Local Planning Policy, and BREEAM standards.

The proposed works consist of the refurbishment and reconfiguration of an existing commercial building located on George Curl Way, Eastleigh and will result in the building providing office space and associated facilities for the Helicopters operation and maintenance. Internal partitions are to be rearranged, with key facilities and services updated to meet modern standards. To the rear, the existing goods delivery access is to be amended to facilitate the storage of the helicopters within the building, with large roller doors being installed.

Externally, boundary protection is to be renewed and enhanced, with the external space to the rear of the building being reconfigured to allow for 2 no. helicopter landing areas.

Energy modelling of the building proposals have been undertaken in accordance with Building Regulations Part L (2021) as applied to refurbishment and change of use developments.



2.0 Planning Policy

Outlined below is a summary of the Planning Policy used to develop the overall sustainability strategy for the Proposed Development

Eastleigh Borough Local Plan (2022) Policy DM2, Environmentally Sustainable Development

1. The Borough Council requires that:

a. all new build residential development (C3 Use Class only) must achieve at the time a Reserved Matters or Full Planning Application is submitted:

i. a 19% improvement in predicted carbon emissions, compared with the building regulations standard current at the time, through increased energy efficiency of the building fabric, unless this is superseded by an updated building regulations requirement equivalent to 'zero carbon homes'; and

ii. a predicted mains water consumption of no more than 110 litres/person/day.

b. all other development that is above 500 sq.m of floorspace measured externally (including extensions and conversions to existing buildings) must achieve BREEAM 'excellent' (or equivalent) or BREEAM 'very good' plus 'passivhaus' certification including a 15% improvement in predicted carbon emissions, compared with the building regulations current at the time, through low or zero carbon energy generation on site or in a Borough location agreed by the Council.

c. all other larger developments above 10,000 sq.m of floorspace should also seek to fund post occupancy evaluation (POE) in addition to the above.

2. In addition to the above, all development above 500 sq.m of floorspace measured externally (including extensions and conversions to existing buildings) and external spaces within the curtilage serving developments of this size should where practical and viable:

a. incorporate energy-efficient passive design principles, the best use of natural daylight and natural ventilation systems wherever possible;

b. connect to any existing near or adjacent low carbon local energy network unless this is proved unviable;

c. use recycled, low embodied carbon, low environmental impact and locally sourced materials in construction where possible;

d. be designed with sufficient flexibility to enable the life of the building to be extended by re-use for other purposes where feasible;

e. aim to deliver at least 1% of all residential units within the whole scheme which achieve full 'passivhaus' certification.



3.0 Assessing Energy Performance and Emissions

In general, energy strategies are required to be formulated on the basis of the Energy Hierarchy which prioritises the reduction of emissions through passive means, prior to the introduction of active, system based emissions savings and renewable energy generation. This ensures that the building is inherently efficient, regardless of the systems put in place for heating, hot water and cooling provision.

The Energy Hierarchy therefore forms the for the development of the energy strategy for the site, in conjunction with the overall design and budgetary constraints present within this reuse of an existing building.

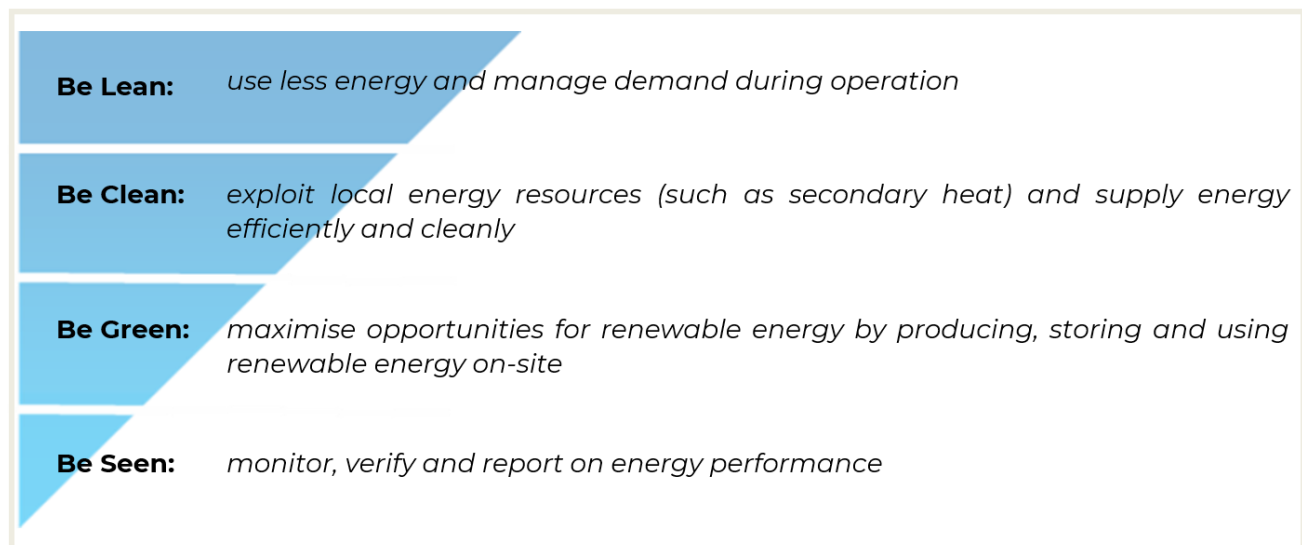


Figure 1: The Energy Hierarchy

3.1 SBEM Modelling

Modelling has been undertaken on the Proposed Development within IES VE 2023 in accordance SBEM methodology and Building Regulations Part L as applied to change of use and refurbishment schemes. The proposed internal layout and other works associated with the building are still in the early stages, therefore reasonable assumptions have been made to provide a reasonable expectation of building performance based on the initial proposals.



3.2 Baseline Emissions Calculation

As part of Building Regulations Compliance, it is required to generate an energy baseline which is based on the minimum legal requirements of the building, based on Section 4 of Building Regulations Part L2.

The energy baseline forms the basis for which all subsequent improvements are measured and is based on the dimensions and layout of the Proposed Development, but with inputs representing the minimum legal requirements needing to be met for each thermal element and installed services. The emissions (BER) and primary energy demand (PER) of the design proposals must improve upon those of the notional building to achieve Building Regulations Part L Compliance.

The SBEM modelling undertaken shows the following Notional Building performance.

Baseline CO ₂ Emissions (kgCO ₂ /m ² /yr)	Baseline Primary Energy Rate (kWh/m ² /yr)
23.7	183.87

Table 1: Baseline Site-Wide Building Performance



4.0 BE LEAN: Building Demand Reduction

In line with the Energy Hierarchy, Passive and Active efficiency measures have been prioritised to reduce energy use and associated emissions.

4.1 Passive Enhancement Measures

The following U values have been used in the energy calculations:

Element	Refurbished	New	Value (W/m ² .K)	Building Regs 2021 Part L Notional
External Walls	no	no	0.45	0.18
Ground Floor	no	no	0.45	0.18
External Roof	no	no	0.25	0.16
Internal ceiling to external roof	no	yes	1.0	0.35
Windows & doors	no	no	3.3 (G=0.63)	1.60
Vehicle access door	no	Yes	3.3	1.30

Table 2: Fabric U-Value Summary

Being an existing building constructed in the year 2000, the ability to upgrade the building is highly dependent on the level of works being undertaken.

The proposed works at present are relatively 'light touch' in nature, with the building fabric being largely untouched as part of the works. The orientation – and to some degree the level of glazing on the facades – is also fixed, with minimal ability for this to change. The strategy here has therefore been to enhance the building fabric as much as feasible given the constraints imposed.

Elements of internal works have been incorporated to enhance the performance of the space, with a new insulated suspended ceiling installed to reduce the volume of space needing to be heated or cooled, reducing costs and emissions associated with building servicing.

Existing glazing and external wall fabric is to be retained and made good where required.

Air tightness – the leakage of air through the building fabric – has therefore been modelled at the default rate of 15m³/hr/m², with air testing to be considered as part of the post completion works, dependent on the final specification proposed.

Elements of the building are to be newly installed to meet the access requirements of the new occupier. These are to be specified in excess of building regulations requirements to enhance overall building performance.

4.2 Active Enhancement Measures

The works proposed on site are to replace all major elements of plant. This is on the basis that the rearrangement of the existing plant to meet the new layout, and the re-commissioning of this equipment will be similar in cost and overall works to that of a total replacement. Therefore it has been deemed that the client should benefit from the installation of new, highly efficient plant as part of this renewal process.

Both heat generation plant and air handling units are to be installed, with sizing appropriate to the buildings overall heating, hot water and cooling demand.



Energy Statement

The current building is serviced by VRF systems which provide heating and cooling, supplemented by air handling plant with heat recovery. This strategy is to be retained with the utilisation of new plant, providing greater efficiency savings.

Hot water use on the site is minimal, with only a kitchenette space and W/Cs using hot water. This is currently provided through point of use, electrical water heaters to minimise storage and transmission losses, and this strategy is also to be retained.

Lighting throughout the site is relatively modern, with approximately 80% of the current fittings being of an LED, low energy type. As much as possible of this existing lighting is to be re-used – either in situ, or re-used within the building configuration. Older, CFL (or other) fittings are to be replaced as part of the site works, to bring 100% of lighting up to modern standards.

Lighting controls will be updated to include the use of PIR sensors to prevent excess or inappropriate lighting use. The use of daylight dimming lighting controls is to be investigated at a later stage within the design process.

Whilst generally mechanically ventilated, the space will also be provided with openable windows for purge ventilation and general health and wellbeing. These will be manually openable by occupants as required to provide additional fresh air to operational spaces.

Mechanical services will require the normal controls for efficient operation of the heat source but further carbon reductions will be made by zoning areas to allow partial occupation out of hours without heating the whole site.

The current Building regulations required different energy uses to be separately metered so that building users can see where energy is being expended. Metering is also important to the BREEAM assessment for metering the energy inputs from all sources. Therefore a building management system has been included under the lean scenario to allow for building optimisation.

The implementation of active and passive efficiency measures results in the following emissions reduction.

Baseline CO ₂ Emissions (kgCO ₂ /m ² /yr)	'Be Lean' CO ₂ Emissions (kgCO ₂ /m ² /yr)	Improvement
23.7	20.34	14.2%

Table 3: Site-Wide Building Performance After 'Lean' Measures



5.0 BE CLEAN: Energy Infrastructure

'Clean' energy solutions prioritise the use of available, existing heating networks, community heating and combined heat and power where this is feasible to support and enhance the growing number of heating networks throughout the country.

As with the lean measures above, the implementation of many of the measures within this section are constrained due to the use of an existing building.

There are no local, existing networks within the immediate vicinity of the building, and the use of combined heat and power would require a gas connection to the site, which is currently not in place.

Therefore, the focus within this building has been the updating and renewing of the existing low carbon building conditioning systems currently in place to maximise savings, at minimal cost to the end client.



6.0 BE GREEN: Low and Zero Carbon Technologies

The proposed refurbishment of the commercial space is aiming to minimise its environmental impact where it is possible and feasible to do so.

As the Client is a charity organisation, there are significant budgetary constraints in place that need to be considered when developing the new energy strategy for the building. None-the-less, the design team have utilised low carbon technologies as much as feasible within the design.

The following section provides a feasibility analysis of Low or Zero Carbon (LZC) technologies for use on the HIOWAA development. There are various options when it comes to LZC technology that could be incorporated within the proposed design, but a combination of project constraints rules out a number of these, with each technology being assessed by some, or all, of the following considerations:

- Capital expenditure
- Return on Investment
- Carbon savings potential
- Clean energy output potential
- Spatial requirements
- Operation and maintenance requirements
- Logistical implications
- Planning requirements

Local constraints, considerations and restrictions are also factored in where these are thought to be relevant to the application of the technology.

The analysis compared all of the factors outlined above to arrive at a solution that is most viable for the site.

6.1 Discounted Technologies

Out of all the technologies considered, the following were discounted for one or more of the reasons outlined above and are classed as not technically feasible on the site:

Hydroelectric: the site is not located near to any potential sources of hydro electric power – therefore this is not considered feasible at this stage.

Hydrogen: generation and storage are still in the experimental stage at this scale and no systems are currently commercially available.

Biomass: Heat demand for the site is relatively low due to high levels of insulation and low hot water use therefore the need for a consistent heat generator on the site is minimum. Coupled with the need for regular maintenance, fuel storage and deliveries, this

CHP: would require a large, constant heat load to be viable, which is not typical of residential properties which have large diurnal fluctuations. The net carbon footprint of CHP systems is becoming less favourable when compared with alternative electrical energy sources as the National Grid decarbonises with an increasing renewable energy contribution. Past analysis on similar schemes has highlighted CHP is a less viable LZC than, for example electric heat pumps.

Biomass CHP: as above.

Wind Turbines: Wind turbine technology is not suitable for locating within the immediate vicinity of an airport – therefore this has been discounted for the site.

6.2 Feasible Technology Assessment

The feasibility study therefore reviewed the use of the following technically feasible technologies to offset CO₂ emissions in further detail:

Ground Source Heat Pumps

Ground source heating involves extracting heat from the ground to heat the building, by circulating water through buried pipes. The length of the pipe depends on the building's energy requirements.

The low-grade heat extracted from the ground is passed through a heat pump, which provides high grade heat (in the form of hot water) to the building. The system can also be used in reverse to provide cooling in summer where this is required. By coupling the heat pump with the ground, a much higher Coefficient of Performance (COP) is achieved than the air source heat pumps more commonly used.

The ground's temperature at around 2m deep remains steady throughout the year at approximately 11°C. In the winter, this relatively high temperature can be taken advantage of as a heat source.

Heat pumps can be a very efficient way of obtaining heat. A heat pump's efficiency is quantified by its coefficient of performance (COP), which is a measure of useful energy produced (heat) against energy used (electricity). A seasonal coefficient of performance (SCOP) is calculated over a typical annual weather profile and signifies the technologies average performance over a typical year. This SCOP is typically what is used to compare differing systems' performance. A typical GSHP may have a SCOP of 4, which means for every unit of electricity used in the heat pump 4 units of heat will be delivered to the building. For reference, direct electric or gas heating systems cannot exceed a SCOP of 1.

The system must be designed to optimise the heat pump; high efficiencies for heat pumps are achieved where the difference in temperature between the heated water and the ground are lowest. Therefore, heat pump technology is especially suited to low temperature heating systems such as under floor heating or delivery through internal fan coil units. A high SCOP value can be achieved where the required temperature is 35 degrees, but this drops significantly where the required temperature is 55 degrees or more – although this is changing as the technologies develop and higher flow temperatures are achieved with higher efficiencies.

The collector type is also a significant factor in performance, and there are typically four types; Horizontal, Vertical, Pond/Lake/River, or Open Loop. Three of these - horizontal, vertical, and pond/lake - are closed-loop systems. The fourth type of system is the open-loop option. Their suitability depends on the climate, soil conditions, available land, and local installation costs at the site. All these approaches can be used for residential and commercial building applications alike.

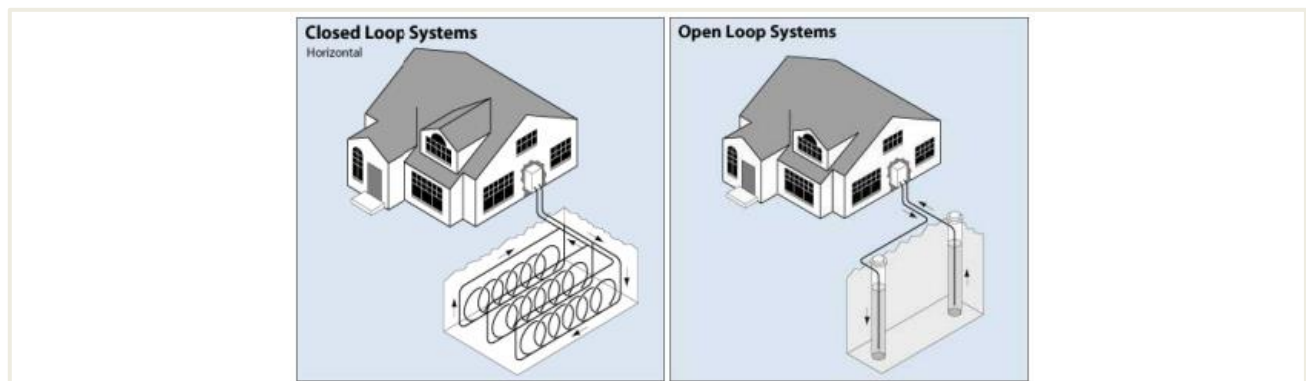


Figure 2: GSHP Open and Closed Loop Systems



Where heating and cooling are demanded simultaneously, a heat recovery heat pump provides the opportunity to recover and redistribute energy between the heating and cooling systems, thereby providing heating and cooling for very little energy input.

For the proposed development, a heat recovery heat pump would provide the opportunity to recover heat between differing areas of the building that may have differing heat/cooling demands based on the activity taking place and orientation.

Common **advantages** of this type of system are:

- High levels of efficiency
- Zero local emissions
- No gas supply required
- Little-to-no external plant required
- Can provide both heating and cooling

Common **disadvantages** of this type of system are:

- Low grade heat is produced meaning the system has to be combined with oversized emitters.
- High capital costs for investigation work and installation
- Not suitable for all areas – dependent on soil/ground conditions
- Maintenance can be costly
- System complexity can cause issues with repairs due to availability of engineers and parts
- Noise can be an issue in some cases

The use of ground source heat pumps could technically be feasible for the scheme. However, the installation of this technology within an existing building, and within a space which is already landscaped and has roads, below ground services and car parking areas already in place presents additional challenges and costs to the proposed development that would be feasible for the Client to consider at this stage.

Based on the above, this technology has been discounted.

Photovoltaics (PVs)

Photovoltaic (PV) technologies are now well established in the UK and generate electricity from sunlight. This electricity can be used on site at the time of generation, exported to the grid, or stored on site (through chemical or thermal batteries, for instance) for use at periods of low generation, but high demand.

The proposed development also has an existing roof which is ideally located to maximised solar generation, with 2 no. areas of south facing roof, exceeding 1000m² in area total.

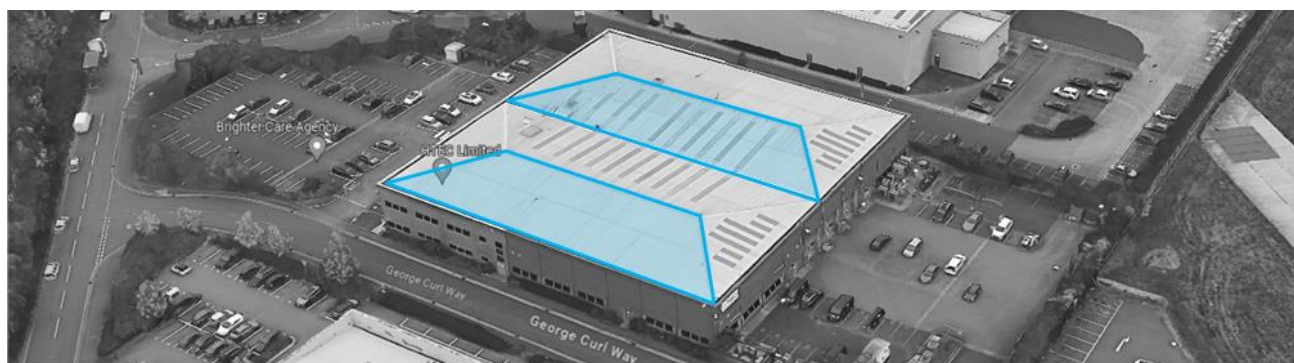


Figure 3: View of Site from South – south facing roof pitch highlighted



PVs have dramatically reduced in price in recent years with installations becoming more common, and panel efficiency increasing, making the technology more accessible. However, the location of the proposed development presents specific challenges that result in PV not being installed at present. However, the opportunity for future installations will be looked at by the Client in more detail once the move to the building is completed, and future enhancements are considered.

The location of the building, within 200m of an active commercial runway, and with active helicopter landing areas proposed, consideration needs to be given to the finishes present on building surfaces which could potentially cause reflection and glare, endangering air traffic in the vicinity. The approach to Southampton Airport is from the south which, makes any south facing reflective surface a potential issue for approaching air traffic.

Roof investigations will also need to be conducted to ensure that the existing structure is able to take the weight of any proposed array and associated fixing systems.

Due to the above potential issues and the additional budgetary constraints of the client being a charity organisation, the installation of PV at this stage is discounted. However, this remains a viable potential future option for the scheme when future improvements are sought.

Advantages of PV:

- Produces clean renewable electrical energy
- Cost is decreasing, and efficiency of PV systems is increasing as technology develops
- High visibility, therefore visible 'green' credentials'
- Once built the energy is virtually free
- Mechanically simple, no moving parts, low maintenance operating costs
- Generally accepted on buildings now
- Modular in nature so easy to size appropriately and extend
- Easy to integrate with battery storage now or in the future
- Good safety record
- Can be integrated into new or existing buildings o Low cost

Disadvantages of PV:

- Solar energy is not a reliable and varies based on local conditions
- PV cells produce DC electricity which must be converted to AC
- Efficiency drops as temperature rises
- Low-voltage output can be difficult to transmit
- Poor reliability of auxiliary (balance of system) components and storage devices.
- Government support no longer offered = Feed-in tariffs ended in April 2019
- Visual impacts – can cause reflection and glare to sensitive surrounding site uses

Solar Thermal Panels

Solar thermal panels are similar to PV above, but generate thermal energy rather than electricity. This is generally used to produce hot water for use within the building. Unlike PV, there is a limit to the viable quantity of solar thermal panels on a building, and this is mainly due to the hot water demand of the building; there is no benefit to generating significant quantities of hot water, if is never used.

As the building is an office/commercial premises, hot water use is incredibly low, with minimal use in the W/C areas and kitchen areas – predominantly for hand-washing and cleaning.

On this basis, the use of solar water heating is discounted as the impact would be negligible at best.



Air Source Heat Pumps

An air-source heat pump (ASHP) extracts heat from external air to provide useful heat within a building. ASHPs are classified as either air-to-air or air-to-water depending on whether the heat distribution system in the building uses air or water. The efficiency of an ASHP is heavily dependent upon the ambient external temperature, with a higher ambient temperature increasing efficiency. At a typical UK minimum temperature of around -5°C, an ASHP achieves a COP of 2 at 55°C water flow temperature.

Heat pumps have some impact on the environment as they need electricity to run, but the heat they extract from the air is constantly being renewed naturally, and emissions from electricity are gradually falling as the UK grid is decarbonised.

In general, heat from the air is absorbed into a fluid which is pumped through a heat exchanger in the heat pump. Low grade heat is then extracted by the refrigeration system and, after passing through the heat pump compressor, is concentrated into a higher temperature useful heat capable of heating water for the heating system and hot water circuits. For cooling, this cycle works in reverse.

Similar to GSHP above, the system works best with lower flow temperatures, therefore the emitters for the building will need to be sized appropriately. Also, like GSHP, heating and cooling can be provided simultaneously, from one piece of equipment through Variable Refrigerant Flow (VRF) systems and internal fan coil units which deliver the heating and/or cooling air.

The **advantages** of air source heat pumps include:

- High efficiency
- Lower capital expenditure and maintenance costs compared to GSHPs
- Can provide heating and cooling independently or simultaneously (dependent on system type)
- No gas supply/infrastructure required
- No ground works required
- No local emissions
- Relatively long life
- Maintenance engineers are relatively common

The **disadvantages** of air source heat pumps include:

- Relatively high capital cost
- Low-grade heat is produced which means that heat emitters must be larger and hot water generation can be difficult
- Maintenance costs are higher compared to gas boilers
- They can be noisy if not attenuated
- External condensers can cause visual impacts if not factored into the overall architectural design.

The current building on the site currently utilises VRF systems to condition all areas of the building and, the reuse of the existing system within the proposals has been considered. However, once the demounting, refitting and re-commissioning of the existing system has been factored in, it has been deemed more appropriate to install more efficient, new plant so that the benefits of this system can be utilised to the fullest extent possible.

Therefore, the use of air source heat pumps is proposed for the scheme for use of both heating and cooling via fan coil units.

The use of replacement ASHP to provide heating and cooling for the building provides the following emissions improvements.



'Be Lean' CO ₂ Emissions (kgCO ₂ /m ² /yr)	'Be Green' CO ₂ Emissions (kgCO ₂ /m ² /yr)	Improvement
20.34	18.28	10.1%

Table 4: Site-Wide Emissions After Green Measures

7.0 CO₂ Emissions Reduction Summary

Passive and Active Efficiency measures have been utilised on the site to reduce energy demand in line with the energy hierarchy.

Error! Reference source not found. below indicates the anticipated Regulated CO₂ emissions following the inclusion of the efficiency measures and Low & Zero Carbon technologies proposed within this report.

Energy Hierarchy	CO ₂ Emissions (kgCO ₂ /m ² /yr)	Improvement	Improvement over baseline
Baseline	23.7		
Lean	20.34	14.2%	14.2%
Clean	20.34	0.0%	14.2%
Green	18.28	10.1%	22.9%

Table 5: Site-Wide Emissions Summary



8.0 BREEAM Passive Design Analysis

As part of meeting planning policy requirements for the site, there is a requirement for the site to meet BREEAM RFO standards.

Whilst planning policy DM2 stipulates an 'Excellent' BREEAM rating is required, Cooper Homewood and the Client have liaised with a BREEAM Assessor who has deemed that, given the 'light touch' nature of the refurbishment a 'very good' rating is proposed as the maximum reasonable rating for the site considering the work that is currently being planned for the building. Given the small scale nature of the proposals, it is considered to be unreasonable to require the applicant to demonstrate BREEAM 'excellent'. In the planning balance, the additional costs for the charity would not be considered to be money well spent and the achievement of the 'Very Good' rating would still constitute a significant improvement to the energy efficiency and sustainability of the building.

Please see the supporting Pre-Assessment undertaken by SRE Ltd which supports this approach and application.

As part of the BREEAM Assessment there is a requirement for an assessment to take place on the building to ensure that passive measures are considered as part of the overall design, and ensure that energy use is minimised as far as practicable.

The assessment below includes the following headings, as outlined within the BREEAM Technical Manual.

- Site location
- Site weather
- Microclimate
- Building layout
- Building orientation
- Building form
- Building fabric
- Thermal mass or other fabric thermal storage
- Building occupancy type
- Daylighting strategy
- Ventilation strategy
- Adaptation to climate change

8.1 Site Location

Situated on the south coast of England, the proposed development benefits from the relatively mild climate compared to other areas of the UK.

Situated approximately 7km north of the Southampton Water, and 18km inland of the Solent, the site is not overly exposed to extreme coastal conditions.

Located within a relatively low lying industrial estate to the west of Southampton Airport, the site comprises of a two storey commercial building with parking to the front (west) and service areas to the rear (east).



Figure 4: Indicative Site Boundary and Wider Context

The M27 motorway runs close to the southern and western boundary of the site, with nearby buildings being of a similar, low level industrial units.

Due to the location and surroundings, the site is relatively exposed, with shelter only provided by nearby buildings to the north and south.

8.2 Site Weather

Located on the south coast of the UK, the site benefits from milder conditions that perhaps are evident elsewhere in the UK.

The following average weather data has been taken from the UK Met Office for the region.

Region:	England SE/Central S
Maximum Temperature:	23.6°C
Minimum Temperature:	1.61°C
Mean Temperature:	11.23°C
Sunshine:	1873.8 Hours
Rainfall:	776.3 mm
Raindays ≥1.0mm:	117.3 days
Days of Air Frost:	37.1 days

Table 6: Met Office Weather Data for England SE/Central S region

8.3 Microclimate

A building microclimate has a significant impact on the overall energy and environmental performance. Generally, the microclimate can be affected by the orientation of the building, its location in relation to other surrounding structures, and the surrounding landscape.

Being an existing building, the ability to impact the microclimate of the area is severely limited with the general massing, height and massing of the building being set. However, this does not necessarily prevent measures being undertaken to limit any additional impacts that could be caused.

The building massing is to remain unchanged, and the local weather conditions will be closely monitored as part of the buildings future operational purpose.

Additional planting to the front of the site is being considered as part of wildlife and ecological enhancement of the site, which is considered as part of planning policy targets and BREEAM requirements, and this is to be consulted on further as part of the detailed design process. However, additional planting to the car park area is to be expected to enhance ecological provision, and provide additional shelter to this area from the prevailing, south westerly winds.



8.4 Passive Design Solutions

The following outlines the solutions or measures implemented or considered as part the passive design analysis, or where limitations prevent further work being undertaken.

Building Layout

Being an existing building, the layout of the building is fixed to some extent. However, the proposed layout focusses the office space to the westerly elevation with the potential for this to reduce cooling load through reduced solar gain (compared to a south facing elevation). Glazing areas are also fixed and will be retained. However, the existing windows are considered to be of appropriate size to provide daylighting to the space without overheating occurring.

Images of the existing site show that the glazing in place is already treated to reduce internal gains, and this will also be retained.

The internal layout of the building is still to be broadly finalised, however in general training and meeting spaces will be located to the westerly elevation to make best use of natural daylight, with beds and sleeping facilities located to the north of the site, where daylight provision is not as important or desired.

The general building layout arrangements will consider the requirements of each space to ensure that environmental performance is maximised through careful use of space.

Building Layout

The Proposed Development consists of the refurbishment of an existing building and therefore the orientation of the building cannot be altered or arranged to maximise performance. However, the internal arrangement of the space will consider this as outlined above.

Building Form

As above, the refurbishment of an existing building limits the ability to alter the building form to improve performance. Therefore this element cannot be considered appropriate.

Thermal Mass or Other Fabric Thermal Storage

The building is constructed of lightweight steel fabric with a composite panel external wall. This highly insulated but lightweight structure does not provide much in the way of thermal mass. However, the ground floor – where the proposed storage areas are to be located – is of a solid concrete type. The storage areas are likely to be minimally conditioned, and therefore the concrete floor will add an element of thermal massing to the area, tempering maximum and minimum temperatures in the spaces at times of extreme temperatures (high or low).

Office areas are generally to be partitioned with lightweight materials, with mechanical cooling and conditioning in place, resulting in a highly responsive internal heating and cooling system, that is not needing to overcome any energy stored within the mass of the building.

Building Occupancy Type

Due to the nature of the buildings intended use, the building will have some element of staffing 24 hours a day. However, the major office spaces will be predominantly occupied during more conventional office hours.

The areas of the building will have heating and ventilation systems installed that are appropriate to the space use, and zoned controls to allow the appropriate control of temperatures within that space in accordance with the needs of the occupants. This will be installed as part of the renewing of the overall HVAC system in the premises.



Daylighting Strategy

The whole building currently benefits from opaque roof lights which provide diffused daylight to the working spaces. This is to be retained for the aircraft storage areas at present. However, for the office space on the first floor, the decision has been made that the reduction in ceiling height, and provision of an insulated suspended ceiling system would be more beneficial to the office spaces, especially during the heating season, where heat will be retained at the working plane.

Windows within the office spaces will be retained to provide internal daylight at current levels.

Artificial lighting will be installed as a supplement to natural light, with daylight dimming sensors to be investigated further at a later design stage to see if this is possible within the current budget and scope.

Ventilation Strategy

The current building is mechanically ventilated in some areas with the potential for external windows to be opened by occupants should this be needed for purge or comfort purposes.

Due to the intended use of the building as an operations base for the Hants and IOW Air Ambulance, external noise is likely to be periodically high, and therefore the ventilation strategy is needing to respond to this. In addition, the nearby M27 and airport create issues around the use of natural ventilation within the space, especially the office and sleeping areas. Therefore a mechanical system is proposed to mitigate and noise ingress.

Adaption to Climate Change

It is likely that the building will be subjected to changes in the climate within its lifetime and the effects cannot always be accurately predicted. However the likelihood of increased external temperatures in the summer is broadly predicted.

Therefore, the building is proposing to increase the level of insulation within the highly occupied spaces to limit the impact of these temperature rises on energy use by reducing heat transfer and generally reducing the volume of space having to be conditioned.

Weather changes will also be factored into the sizing of the HVAC plant to ensure that any systems installed are appropriate for future and current use.

8.5 Summary of Implemented Solutions

Measure	Summary
Site location	Existing Building N/A
Site weather	Existing Building N/A
Microclimate	Existing Building N/A
Building layout	Layout optimised as best as practicable to ensure daylighting within most habitable spaces is maximised, with bedrooms north facing.
Building orientation	Existing Building N/A
Building form	Existing Building N/A
Building fabric	Enhanced fabric internally with suspended ceiling installed to reduce conditioned volume.
Thermal mass or other fabric thermal storage	Exposed concrete ground floor retained within less conditioned spaces to mitigate potential temperature swings.



Building occupancy type	Occupancy to be considered as part of HVAC detailed design to ensure sufficient capacity and ventilation provided.
Daylighting strategy	Offices located to west of site where glazing is predominantly located. Solar coating on glazing to be retained.
Ventilation strategy	New Air Handling strategy to be implemented on site with mechanical ventilation proposed to mitigate aircraft and road noise from the building. Natural vent. Openings to be retained for occupant comfort.
Adaptation to climate change	HVAC sizing and specification to consider potential increase in external temperatures.

Table 7: Summary of Passive Measures



Appendix A – ‘As Designed’ BRUKL

BRUKL Output Document



Compliance with England Building Regulations Part L 2021

Project name

5518 - Green HIOW Air Ambulance

As built

Date: Thu Mar 28 14:29:17 2024

Administrative information

Building Details

Address: Address 1, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.25

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.25

BRUKL compliance module version: v6.1.0.1

Foundation area [m²]: 1869.76

The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	11.57
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	18.28
Target primary energy rate (TPER), kWh _e /m ² annum	80.73
Building primary energy rate (BPER), kWh _e /m ² annum	130.29
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	0.45	0.45	BL00000C:Surf[6]
Floors	0.18	0.45	0.45	BL000007:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.25	0.25	RC000000:Surf[1]
Windows** and roof windows	1.6	3.3	3.3	BL00000C:Surf[0]
Rooflights***	2.2	3.3	3.3	WR000000:Surf[3]
Personnel doors [^]	1.6	3.3	3.3	PR000001:Surf[4]
Vehicle access & similar large doors	1.3	1.7	3.3	BL00000F:Surf[0]
High usage entrance doors	3	3.3	3.3	RC000000:Surf[6]

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]

U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

U_i-Calc = Calculated maximum individual element 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	15

**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	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Warm air heater

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.8	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

2- Fan coil systems

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.5	5.8	0	1.1	0.75
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

3- Electric Panel heaters

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.8	-	0.2	-	-
Standard value	0.86	N/A	0.55	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- Electric Panel heaters With extract ventilation

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.8	-	0.2	-	-
Standard value	0.86	N/A	0.55	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- Gas warm air system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.86	-	0.2	-	-
Standard value	0.91	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- DHW - POU

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.005
Standard value	1	N/A



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		
Office		-	-	-	-	-	-	-	0.5	-	-	N/A
Meeting Room		-	-	-	-	-	-	-	0.5	-	-	N/A
Project Ops		-	-	-	-	-	-	-	0.5	-	-	N/A
FO Manager		-	-	-	-	-	-	-	0.5	-	-	N/A
Product		-	-	-	-	-	-	-	0.5	-	-	N/A
Product		-	-	-	-	-	-	-	0.5	-	-	N/A
Orbis		-	-	-	-	-	-	-	0.5	-	-	N/A
HR		-	-	-	-	-	-	-	0.5	-	-	N/A
Orbis		-	-	-	-	-	-	-	0.5	-	-	N/A
Orbis		-	-	-	-	-	-	-	0.5	-	-	N/A
Canteen		-	-	-	-	-	-	-	0.5	-	-	N/A
Training Room		-	-	-	-	-	-	-	0.5	-	-	N/A
Seeding		-	-	-	-	-	-	-	0.5	-	-	N/A
Logistics Manager		-	-	-	-	-	-	-	0.5	-	-	N/A
Office		-	-	-	-	-	-	-	0.5	-	-	N/A
Kitchen		-	-	-	-	-	-	-	0.5	-	-	N/A
WC		0.5	-	-	-	-	-	-	-	-	-	N/A
Male WC		0.5	-	-	-	-	-	-	-	-	-	N/A
Female WC		0.5	-	-	-	-	-	-	-	-	-	N/A
Male WC		0.5	-	-	-	-	-	-	-	-	-	N/A
Female WC		0.5	-	-	-	-	-	-	-	-	-	N/A
Male WC		0.5	-	-	-	-	-	-	-	-	-	N/A
Office		-	-	-	-	-	-	-	0.5	-	-	N/A
Female WC		0.5	-	-	-	-	-	-	-	-	-	N/A
Bed/pods		-	-	-	-	-	-	-	0.5	-	-	N/A
Reception		-	-	-	-	-	-	-	0.5	-	-	N/A
Meeting Room		-	-	-	-	-	-	-	0.5	-	-	N/A
Meeting Room		-	-	-	-	-	-	-	0.5	-	-	N/A
Dis WC		0.5	-	-	-	-	-	-	-	-	-	N/A
WC		0.5	-	-	-	-	-	-	-	-	-	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
Office		-	-	-	-	-	-	-	0.5	-	-	N/A
Office		-	-	-	-	-	-	-	0.5	-	-	N/A
Meeting room		-	-	-	-	-	-	-	0.5	-	-	N/A
WC		0.5	-	-	-	-	-	-	-	-	-	N/A
Kitchen		-	-	-	-	-	-	-	0.5	-	-	N/A
WC		0.5	-	-	-	-	-	-	-	-	-	N/A
Office		-	-	-	-	-	-	-	0.5	-	-	N/A
Kitchenette		-	-	-	-	-	-	-	0.5	-	-	N/A
Helpdesk		-	-	-	-	-	-	-	0.5	-	-	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
Meeting/ training room		100	-	-
Office		100	-	-
Meeting Room		100	-	-
Stair		100	-	-
Project Ops		100	-	-
FO Manager		100	-	-
Product		100	-	-
Product		100	-	-
Orbis		100	-	-
HR		100	-	-
Orbis		100	-	-
Orbis		100	-	-
Circulation		100	-	-
Server Room		100	-	-
Data Centre Storage		100	-	-
Circulation		100	-	-
Canteen		100	-	-
Training Room		100	-	-
Seeding		100	-	-
Logistics Manager		100	-	-
Office		100	-	-
Kitchen		100	-	-
Circulation		100	-	-
WC		100	-	-
Supply Cupboard		100	-	-
Male WC		100	-	-
Circulation		100	-	-
First Aid		100	-	-
Grid		100	-	-
Female WC		100	-	-



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
Circulation		100	-	-
Male WC		100	-	-
Female WC		100	-	-
Male WC		100	-	-
Circulation		100	-	-
Office		100	-	-
Female WC		100	-	-
Bed/pods		100	-	-
Reception		100	-	-
Meeting Room		100	-	-
Meeting Room		100	-	-
Plant room		100	-	-
Dis WC		100	-	-
WC		100	-	-
Circulation		100	-	-
Office		100	-	-
Office		100	-	-
Circulation		100	-	-
Circulation		100	-	-
Meeting room		100	-	-
WC		100	-	-
Kitchen		100	-	-
WC		100	-	-
Circulation		100	-	-
Office		100	-	-
Kitchenette		100	-	-
Void		100	-	-
Warehouse		100	-	-
Helpdesk		100	-	-
Warehouse		100	-	-
Prep		100	-	-
Stores		100	-	-

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?
Office	NO (-54.5%)	NO
Meeting Room	NO (-46%)	NO
Project Ops	NO (-55.1%)	NO
FO Manager	NO (-68.5%)	NO
Product	NO (-50.9%)	NO
Product	NO (-62.6%)	NO
Orbis	NO (-38%)	NO
HR	NO (-71.6%)	NO



Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Orbis	NO (-42.5%)	NO
Orbis	NO (-58%)	NO
Canteen	NO (-63.3%)	NO
Training Room	N/A	N/A
Seeding	N/A	N/A
Logistics Manager	N/A	N/A
Office	N/A	N/A
Kitchen	N/A	N/A
Office	N/A	N/A
Bed/pods	NO (-70.3%)	NO
Reception	YES (+54.3%)	NO
Meeting Room	NO (-40.9%)	NO
Meeting Room	NO (-44.3%)	NO
Office	NO (-51.4%)	NO
Office	NO (-33.9%)	NO
Meeting room	NO (-81.1%)	NO
Kitchen	N/A	N/A
Office	NO (-58.2%)	NO
Kitchenette	N/A	N/A
Helpdesk	NO (-51.8%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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



Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Floor area [m ²]	4843.4	4843.4		Retail/Financial and Professional Services
External area [m ²]	9101.7	9101.7		Restaurants and Cafes/Drinking Establishments/Takeaways
Weather	LON	LON		Offices and Workshop Businesses
Infiltration [m ³ /hm ² @ 50Pa]	15	3		General Industrial and Special Industrial Groups
Average conductance [W/K]	4709.51	1860.34		Storage or Distribution
Average U-value [W/m ² K]	0.52	0.2		Hotels
Alpha value* [%]	25.34	10		Residential Institutions: Hospitals and Care Homes
* Percentage of the building's average heat transfer coefficient which is due to thermal bridging				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
			100	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	69.47	40.58
Cooling	2.02	2.69
Auxiliary	9.74	7.38
Lighting	14.87	19.53
Hot water	4.56	4.05
Equipment*	59.47	59.47
TOTAL**	100.66	74.23

* 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	0	10.41
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>10.41</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	305.1	184.33
Primary energy [kWh _{PE} /m ²]	130.29	80.73
Total emissions [kg/m ²]	18.28	11.57