



Clowes Developments (UK) Ltd

Outline Planning Application
for Development
at

Former Landfill site
Brockhampton West
Harts Farm Way

Energy Strategy

Planning Submission



Client Name Clowes Developments (UK) Ltd

Client Address Ednaston Park
Painter's Ln
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Property: Former Landfill site
Brockhampton West
Harts Farm Way
Havant

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EXECUTIVE SUMMARY

The energy strategy adopts a hierarchical approach using passive and low energy design technologies to reduce baseline energy demand and CO₂ emissions followed by the application of low and zero carbon technologies. This strategy is in line with the relevant Havant Borough Council policies.

As there are no specific carbon emission reduction targets in the Havant Borough Council adopted Core Strategy or the emerging Local Plan, this energy strategy is based on achieving Building Regulations Part L compliance by energy efficiency measures alone along with a 10% carbon emission reduction from onsite LZCs which when these two measures are combined give the mandatory score of 5 for an excellent rating from BREEAM credit Ene01.

Considering the above the focus of this energy strategy is on CO₂ reduction by using a highly efficient building envelope with high efficiency mechanical and electrical services, along with air source heat pump (variable refrigerant flow systems) and photovoltaic (PV) cell renewable technology.

As this is an outline application the three units shown on the illustrative scheme layout have been modelled as representative building type and size options that could be constructed on the site rather than just using benchmark data.

For each representative unit, the results for the modelling indicate the targets set for this energy strategy are met. When the results for each of the three representative units are combined the result is a proposed illustrative development with predicted performance of:

- CO₂ emissions reduction of 29.99 % over the Building Regulations 2013 compliant baseline scheme.
- The passive/energy efficiency measures are predicted to achieve a 21.67 % CO₂ reduction over the baseline building regulations compliant scheme.
- The renewable energy technologies of air source heat pumps and photovoltaic cells are predicted to achieve a 14.8 % CO₂ reduction.
- When unregulated uses are taken into account there is a predicted reduction of 24.77 % in the development's annual CO₂ emissions.
- The energy strategy is predicted, using the Building Regulations calculation methodologies, to achieve an annual carbon emission saving of 187.75 tonnes over the baseline scheme.

The carbon dioxide emission and savings values, for the illustrative development, are as follows:

	CO ₂ Emissions (Tonnes per annum)	
	Regulated	Unregulated
Baseline Building Regulations 2013 Part L Compliant Development	626.06	758.02
After passive/low energy (energy demand) reduction	490.41	622.38
After CHP or decentralised heating	490.41	622.38
After renewable energy	438.31	570.27



	Regulated CO ₂ Savings	
	Tonnes per annum	%
Be Lean: Savings from passive/low energy (energy demand) reduction	135.65	21.67%
Be Clean: Savings from CHP or decentralised heating	0.00	0.00%
Be Green: Savings from renewable energy	52.10	10.62%
Total Cumulative On-Site Savings	187.75	29.99%

As shown in the tables above the illustrative development exceeds the Havant Borough Council minimum carbon emission targets and in addition the development meets the Applicant's aspirational targets set for performance of the development.

The carbon emission reductions achieved for the building type and size options modelled have been incorporated in a Framework Table indicating the predicted performance for alternative unit sizes that could be provided to the site.

Building Type	Size (Gross Internal Area)	CO ₂ Reduction Target
B1c / B2 / B8 Industrial / Warehouse	18,000 - 55,000 ft ² (1,672 to 5,110 m ²)	Part L compliance from energy efficiency measures alone, a 10% reduction on regulated energy from onsite LZCs plus a minimum score of 5 for BREEAM credit Ene01
	55,000 – 125,000 ft ² (5,110 – 11,613 m ²)	
	Over 125,000 ft ² (11,613 m ²)	



1.00 INTRODUCTION

1.01 Purpose

This report has been prepared on behalf of Clowes Developments (UK) Ltd for the proposed development at Harts Farm Way, Havant. This document assesses the proposed energy strategy and demonstrates how it seeks to satisfy the applicable Havant Borough Council policies on energy and carbon dioxide emission when applied to the three unit illustrative scheme.

The report contains the predicated energy and carbon emission assessment results for the development and identifies savings from the proposed low and zero carbon technologies to be incorporated into the scheme.

The energy and carbon dioxide emission assessment has been undertaken using dynamic simulation modelling software EDSL TAS Version 9.5.1. Based on the building design submitted with the planning application the modelling will identify the energy and carbon dioxide savings related to the building envelope design and efficient mechanical and electrical services systems followed by the improvement using the proposed low and zero carbon (renewable) technologies for the scheme.

1.02 Scheme Composition

Outline application for the development of new employment units to provide up to 29,000 sq m (gross internal area) for flexible use across use classes E (light industrial), B2 and B8 with ancillary offices, car parking, service yards, drainage works, landscaping and associated works to prepare the site for development. All matters are reserved except the primary means of access to the site.

This outline planning application is supported by an illustrative three unit scheme option. The illustrative scheme is not intended to be an approved document but do provide an indication of possible development content and configuration.

The three unit illustrative scheme option is included in the appendix.

The review of the illustrative scheme option gives a robust basis for the conclusions drawn from this framework energy strategy.

Whilst there are many ways in which the development could evolve it will always comprise a small number of general industrial, light industrial and warehouse single storey buildings of varying sizes developed on either a speculative or pre-let basis with typically an ancillary office content of around 5% to 15%.

1.03 Industrial Units

The industrial unit illustrative scheme consists of multiple speculative warehouse units with associated office accommodation. The units will be built as a shell warehouse with the associated office space being provided with comfort cooling and heating and fitted out to a Category A standard.

By their speculative nature the final use of the industrial units cannot be defined at this early stage. In terms of energy usage, it is assumed for estimating energy usage that the shell warehouse areas will be heated although this will ultimately be dependent on the future tenants bespoke needs.



The fitting out of the industrial area for a specific process, for all of the units, would require bespoke systems to suit the tenants' individual needs arising at the time of letting, which would all require assessment under ADL2B.

The servicing strategy for the industrial units, which is optimised to exploit lower carbon emission factors for electrical plant within SAP10, will be as follows:

- Warehouse heating No heating, see the note below.
- Office area heating and cooling Air source heat pumps serving refrigerant based variable refrigerant flow (VRF) comfort cooling and heating systems.
- Core area heating Electric radiators.
- Domestic hot water Electric point of use water heaters.

For thermal assessment purposes the shell warehouse areas are assumed to be heated by direct/indirect gas fired heaters. A gas service will be provided to each space but left capped off for extension by the tenant as considered necessary to serve either convector unit heaters or radiant tubular heaters. These systems are preferred by tenants as they offer the most flexibility in terms of control and efficiency in performance compared to water based systems. The thermal simulation utilised gas fired multi-burner radiant heaters with a seasonal efficiency of 91%. Higher efficiencies are common practice and therefore the models allow for some flexibility in terms of the system employed by the future tenant. Additionally, it is assumed that the future tenant fit-out warehouse lighting will utilise LED luminaires with photocell dimming and PIR occupancy controls. The efficacy of the lighting is set at 100 lm/w but as with the heating system, higher efficacies are achievable.

1.04 Reservation

This report has been prepared solely for the use of the applicant and Watkins Payne Partnership accept no responsibility for its use by any third parties.



2.00 POLICY REVIEW

2.01 National Policy

The National Planning Policy Framework sets out the planning policies for England that are to be taken into account within local planning policies. The framework itself does not have specific policies but identifies the purpose of achieving sustainable development.

2.02 Havant Borough Council

The current Havant planning policy incorporates a single main document that outlines their sustainable design and construction policies. The applicable document is:

- Havant Core Strategy, March 2011.

Havant Core Strategy,

The key policy from the Core Strategy is as follows:

Policy CS14 Efficient Use of Resources

Planning permission will be granted for development that:

- 1. Provides adequate land or funding for waste management infrastructure.*
- 2. Locally contributes to the delivery of the PUSH target of 100MW of renewable energy by 2020 for the whole of the PUSH area. Major areas of development must ensure that their on-site renewable energy production is maximised and resource efficiency is maximised:*
 - o Residential development – Level 3 of the Code for Sustainable Homes;*
 - o Multi occupation homes and non-residential development over 500sqm - BREEAM standard ‘very good’.*
 - o Improvements to these standards throughout the plan period will be encouraged.*
 - o Particular attention should be paid to water efficiency measures.*
- 3. On completion, unless proven to be financially or technically unviable, meets the following standards:*
- 4. Allowable Solutions’ may be used to achieve higher levels of carbon reduction where on-site proposals are not feasible or viable.*

2.03 Emerging Local Plan

The submission version of the emerging Havant Borough Council Local Plan identifies key emerging policies associated with low carbon design as noted below:

E12 Efficient use of resources and low carbon design

Development proposals which are intended to improve the efficiency measures of existing buildings or provide low or zero carbon energy will be supported in principle. Development proposals which involve an increase in non-residential floorspace or a net gain in overnight accommodation will be expected to:

- a. Reuse existing buildings’ construction materials wherever possible;*
- b. Appropriately integrate solar gain, natural ventilation or ventilation with heat recovery, fabric performance and Passivhaus principles into the layout and design;*
- c. Minimise greenhouse gas emissions and improve energy efficiency of buildings; and*



- d. *Use district heat or combined heat and power (CHP or CCHP) (existing or proposed or on-site), where appropriate;*

Energy efficiency in Non-residential development and BREEAM multi-residential

- e. *As well as addressed in points a) to d) above, proposals for non-residential and multi-residential development are expected to achieve the following standards of the Building Research Establishment's Environmental Assessment Method (BREEAM):*

<i>Ground floor space to be built (sqm)</i>	<i>BREEAM level to be achieved</i>
<i>0-499</i>	<i>Achieving at least Pass under BREEAM is encouraged</i>
<i>500-999</i>	<i>Very Good</i>
<i>1000+</i>	<i>Excellent</i>

Energy Efficiency in Residential development

As well as addressing points a) to d) above, proposals for residential development are expected to achieve the following standards:

- f. *A reduction in CO2 emissions of at least 19% of the Dwelling Emission Rate (DER) compared to the Target Emission Rate of Part L of the Building Regulations is achieved; and*
- g. *The development has demonstrated its long-term sustainability and cumulative impacts using one or both of the following tools as appropriate:*
- Assessment under the Home Quality Mark (HQM) ONE, or equivalent, for any development of one dwelling or more (gross)*
 - Assessment under the BREEAM Communities scheme, or equivalent, for any development of 100 dwellings or more (gross).*

Water Efficiency

As well as addressing points a) to d) above, proposals which result in a net gain of overnight accommodation must include measures to achieve a maximum water use of 110 litres of water per person, per day, including external water use.



3.00 OUTLINE METHODOLOGY

3.01 Energy Strategy

The fundamental approach for the energy strategy is as follows:

- Establish the baseline energy demand in line with statutory requirements in terms of Building Regulations Part L2A: 2013 compliance using accredited thermal modelling software plus allowance for energy consumed by elements not covered in the 2013 Building Regulations.
- Adopt passive and low energy design techniques in order to reduce the energy demand for the development beyond the baseline energy demand requirements.
- Assess the potential decentralised heating, cooling and power measures available to suit this development and establish potential energy/carbon dioxide reduction for viable solutions (clean scheme).
- Assess the potential low and zero carbon (renewable) technologies to suit the development and establish potential energy/carbon dioxide reduction for viable solutions.
- Establish the anticipated energy and carbon dioxide emission reductions for the development using Building Regulations 2013 calculation methodologies.

This approach is in line with the principles detailed within the relevant policy statements and regulatory guidelines listed in section 2.00.

3.02 Energy Strategy Target

As there are no specific carbon emission reduction targets in the Havant Borough Council adopted Core Strategy or the emerging Local Plan, this energy strategy is based on achieving the following:

- Building Regulations Part L compliance by the incorporation of energy efficiency measures alone.
- A 10% carbon emission reduction from onsite LZCs.
- When the above two measures are combined, they give the mandatory minimum score of 5 for an excellent rating from BREEAM credit Ene01.



4.00 ENERGY DEMAND ASSESSMENT

4.01.01 General

Whilst benchmark figures for the carbon dioxide analysis could be used, based upon Building Regulations Part L 2013 modelling for similar industrial/warehouse buildings, the output from such modelling does not provide a usable platform for assessing ways to reduce energy demand, supply energy efficiently and use renewable energy at the development. Therefore, the energy demand assessment for this framework energy strategy adopts the format of carrying out thermal modelling of buildings with the same planning use and of similar sizes to those anticipated at the development.

The dynamic simulation modelling has therefore been applied to the building size and type options shown on the three unit illustrative scheme that is included with this application. The illustrative units typify the use and size range of buildings which would be permitted by the proposed outline planning permission as both use and size have a bearing on the output of Part L2A modelling. The building use and size range categories are:

Unit 2 (52,580ft ²)	B1c/B2/B8 buildings from	18,000 to 55,000 ft ² (1,672 to 6,039 m ²)
Unit 3 (57,145ft ²)	B1c/B2/B8 buildings from	55,000 to 125,000 ft ² (6,039 to 11,613 m ²)
Unit 1 (185,970ft ²)	B1c/B2/B8 buildings over	over 125,000 ft ² (11,613 m ²)

The energy demand assessment work has been undertaken using EDSL TAS dynamic simulation software Version 9.5.1 that incorporates the SBEM calculation methodology in line with Building Regulations Part L2A: 2013 requirements in order to generate a predicted annual CO₂ emission rate.

Within the energy demand assessment, the following SAP2012 carbon dioxide emission intensity factors have been used in line with Part L2A: 2013.

Fuel	kg CO ₂ / kWh
Natural gas	0.216
Grid supplied electricity	0.519
Grid displaced electricity	0.519

4.01.02 Regulated and Un-Regulated Energy

This framework energy strategy shows how policy compliance for the “regulated” energy can be achieved at the development and makes reference to the estimated “un-regulated” energy usage by means of energy benchmarks.

For clarity “regulated” and “un-regulated” energy are summarised as follows:

- Regulated Energy This is the energy covered by Approved Document L2A of the Building Regulations i.e. the energy used in heating, cooling, fans and pumps plus domestic hot water
- Un-regulated Energy This is energy used within a building that is not covered by the Building Regulations i.e. the energy used for general small power loads, lifts, external lighting, catering electricity etc.



The planning policy CO₂ reduction targets are based in “regulated” energy only. Hence the % CO₂ emission savings target is not adversely affected by the estimated “un-regulated” energy in a building.

The assessed un-regulated energy uses for the proposed uses at the site are as follows:

Industrial Unit: General small power
 Lifts
 External lighting
 Catering electricity

4.01.03 **Energy Benchmarks**

The “un-regulated” energy use and benchmarks for this framework energy strategy have been derived from data and guidance taken from the following Chartered Institute of Building Services Engineers (CIBSE) documents:

1. CIBSE Guide F – Energy Efficiency in Buildings: 2012
2. CIBSE Technical Memorandum – Energy Benchmarks TM46: 2008

The un-regulated energy use values have been derived from the CIBSE Guide F Benchmark Section. The specific benchmarks used and the resultant estimated un-regulated energy values are as follows:

Industrial Unit: Industrial unit benchmarks good practice type 5 (distribution and warehouse) of 9.0 kWh/m²/year that equates to 4.67 kgCO₂/m²

4.02 **Baseline Scheme**

The baseline demand is the Building Regulations Part L2A: 2013 target emission rate (TER).

The Part L2A: 2013 TER is derived from the thermal model based on the National Calculation Methodology (NCM). The review has been carried out utilising the TAS dynamic thermal modelling software version 9.5 that has achieved accreditation from the Department of Communities and Local Government (DCLG).

4.02.01 **Unit 1**

The baseline CO₂ emissions for unit 1 are modelled as follows:-

	CO₂ Emission (kg CO₂/m²/year)
Heating	5.75
Cooling	0.56
Fans and Pumps	0.84
Lighting	9.74
Domestic Hot Water	3.77
Part L2A: 2013 TER	20.66
Unregulated Uses	4.67
Total	25.33



The annual CO₂ emission resulting from the baseline demand equates to the following:

	CO₂ Emission (Tonnes CO₂/year)
	Unit 1
Without un-regulated uses	357.83
With un-regulated uses	438.72

4.02.02 Unit 2

The baseline CO₂ emissions for unit 2 are modelled as follows:-

	CO₂ Emission (kg CO₂/m²/year)
Heating	8.81
Cooling	0.37
Fans and Pumps	0.70
Lighting	9.58
Domestic Hot Water	3.67
Part L2A: 2013 TER	23.13
Unregulated Uses	4.67
Total	27.80

The annual CO₂ emission resulting from the baseline demand equates to the following:

	CO₂ Emission (Tonnes CO₂/year)
	Unit 2
Without un-regulated uses	115.92
With un-regulated uses	139.34

4.02.03 Unit 3

The baseline CO₂ emissions for unit 3 are modelled as follows:-

	CO₂ Emission (kg CO₂/m²/year)
Heating	6.93
Cooling	0.85
Fans and Pumps	1.50
Lighting	10.52
Domestic Hot Water	5.92
Part L2A: 2013 TER	25.72
Unregulated Uses	4.67
Total	30.39



The annual CO₂ emission resulting from the baseline demand equates to the following:

	CO₂ Emission (Tonnes CO₂/year)
	Unit 3
Without un-regulated uses	152.30
With un-regulated uses	179.96

4.02.04 Development

Combining the baseline CO₂ emissions for each of the units gives the following development CO₂ emissions:

	CO₂ Emission (kg CO₂/m²/year)
Heating	6.54
Cooling	0.59
Fans & pumps	0.95
Lighting	9.87
Domestic Hot Water	4.20
Part L2A: 2013 TER	22.16
Unregulated Uses	4.67
Total	26.83

The annual CO₂ emission resulting from the baseline demand equates to the following:

	CO₂ Emission (Tonnes CO₂/year)
	Development
Without un-regulated uses	626.06
With un-regulated uses	758.02

4.03 Energy Efficiency Measures

The energy strategy prioritises the reduction in energy consumption and hence CO₂ emissions through the building envelope design together with the use of efficient mechanical and electrical services.

The passive and low energy design principles that have been adopted in the current design include:

- High performance glazing.
- Improved building fabric.
- Low building air leakage rate of 3.0 m³/hr/m² @ 50 Pa, which represents a 70% improvement over the minimum 2013 Building Regulations requirement, has been used.
- Variable speed fans and pumps
- Low energy lighting (LED) lighting to the office, core and warehouse areas.
- Automatic lighting control with occupancy and daylight dimming controls



4.03.01 Unit 1

The Building Regulations thermal model analysis identifies the following CO₂ emissions for unit 1:-

	Baseline Scheme (kg CO ₂ /m ² /year)	Lean Scheme (kg CO ₂ /m ² /year)
Heating	5.75	4.01
Cooling	0.56	0.80
Fans and pumps	0.84	1.47
Lighting	9.74	4.62
Domestic Hot Water	3.77	5.60
Part L2A : 2013 Total	20.66	16.50
Unregulated Power	4.67	4.67
Total	25.33	21.17

	CO ₂ Emission (Tonnes per annum)	
	Regulated	Unregulated
Baseline Scheme	357.83	391.49
Lean Scheme	285.70	319.37

	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per year	% Improvement
Be lean: savings from energy demand reduction	72.12	20.2%

4.03.02 Unit 2

The Building Regulations thermal model analysis identifies the following CO₂ emissions for unit 2:

	Baseline Scheme (kg CO ₂ /m ² /year)	Lean Scheme (kg CO ₂ /m ² /year)
Heating	8.81	3.94
Cooling	0.37	0.34
Fans and pumps	0.70	0.91
Lighting	9.58	4.94
Domestic Hot Water	3.67	5.47
Part L2A : 2013 Total	23.13	15.56
Unregulated Power	4.67	4.67
Total	27.80	20.24



	CO ₂ Emission (Tonnes per annum)	
	Regulated	Unregulated
Baseline Scheme	115.92	139.34
Lean Scheme	78.02	101.43

	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per year	% Improvement
Be lean: savings from energy demand reduction	37.91	32.7%

4.03.03 Unit 3

The Building Regulations thermal model analysis identifies the following CO₂ emissions for unit 3:-

	Baseline Scheme (kg CO ₂ /m ² /year)	Lean Scheme (kg CO ₂ /m ² /year)
Heating	6.93	3.42
Cooling	0.85	1.26
Fans and pumps	1.50	2.51
Lighting	10.52	5.38
Domestic Hot Water	5.92	8.79
Part L2A : 2013 Total	25.72	21.36
Unregulated Power	4.67	4.67
Total	30.39	26.03

	CO ₂ Emission (Tonnes per annum)	
	Regulated	Unregulated
Baseline Scheme	152.30	179.96
Lean Scheme	126.50	154.16

	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per year	% Improvement
Be lean: savings from energy demand reduction	25.80	16.9%



4.03.04 Development

Combining the Building Regulations thermal model analysis gives for each of the five units the following CO₂ emissions for the development:-

	Baseline Scheme (kg CO₂/m²/year)	Lean Scheme (kg CO₂/m²/year)
Heating	6.54	3.88
Cooling	0.59	0.81
Fans and pumps	0.95	1.59
Lighting	9.87	4.83
Domestic Hot Water	4.20	6.24
Part L2A : 2013 Total	22.16	17.36
Unregulated Power	4.67	4.67
Total	26.83	22.03

	CO₂ Emission (Tonnes per annum)	
	Regulated	Unregulated
Baseline Scheme	626.06	758.02
Lean Scheme	490.41	622.38

	Regulated Carbon Dioxide Savings	
	Tonnes CO₂ per year	% Improvement
Be lean: savings from energy demand reduction	135.65	21.67%



5.00 HEATING INFRASTRUCTURE (BE CLEAN)

5.01 General

The potential use of site-wide heat networks for the development have been assessed in relation to the following:

- Connection to an area wide heat network
- Communal heating system
- Individual heating system

5.02 Connection to an area wide heat network

Investigations into site-wide heat networks has established that there is no existing or proposed infrastructure arrangement within a reasonable distance from the development site.

Due to decarbonisation of the national grid using electricity for heating via the proposed air source heat pumps (ASHPs) in section 6.00 will be less carbon intensive than the burning of gas in a typical energy centre CHP plant.

A further study produced by the department for Business, Energy and Industrial Strategy (BEIS) suggests that by 2025 the carbon emissions factor of electricity will be as low as 0.12kg CO₂/kWh which is nearly half of that of the current carbon emission factor of gas. Therefore, taking the mentioned points into consideration the heating demand of the development is better met with electrically powered ASHPs rather than by any existing heat network.

5.03 Communal Heating System

The provision of a decentralised energy centre (DEC) to serve the industrial development incorporating a gas fired CHP to provide the heating and hot water base load for the development and an air cooled chiller to provide chilled water to facilitate the comfort cooling of the development has been reviewed and concluded as not viable for the development for the following reasons:

- When compared to the proposed variable refrigerant flow (VRF) air source heat pump comfort cooling and heating system, the thermal distribution pumping energy and the heat loss/gain of the distribution pipework actually increases the carbon emissions from the whole development when compared to the proposed solution.
- The electrical output of a central CHP cannot be distributed in a fair manner to all of the industrial units.

5.04 Individual Heating System

Based on the principles noted above individual heating systems are proposed to each unit.



6.00 RENEWABLE ENERGY ASSESSMENT (BE GREEN)

6.01 General

The potential use of renewable energy technology has been undertaken for the following:

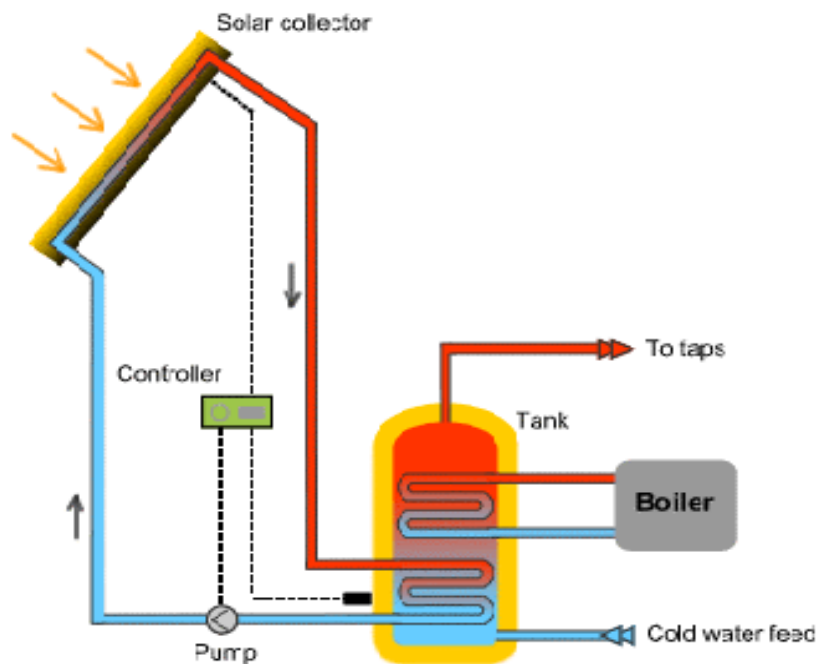
- Solar water heating
- Wind turbines
- Photovoltaic cells
- Biomass
- Ground source heating and cooling
- Air source heating and cooling
- Fuel cell
- Water source heating and cooling

6.02 Solar Water Heating

Solar thermal panels utilise the sun's energy to generate hot water for use within the building. The panels are commonly provided in either flat plate or evacuated tube arrangements. The panels are ideally located facing south at an approximate 30° inclination angle in areas where they are not subjected to shade.



The development has the potential to use solar water heating to pre-heat the domestic hot water service, and hence it is considered viable for the development.



Each of the units has the potential to use solar water heating to pre-heat the domestic hot water service. However, as an industrial unit's domestic hot water demand is low, solar water heating has not been proposed for the development. The available roof space has been prioritised for the proposed photovoltaic cells, Section 6.04.

6.03 Wind Turbines

Wind turbines generate electrical energy derived from kinetic energy provided by the local wind resource. The performance of wind turbines depends greatly on the wind speed and turbulence that in turn is influenced by the terrain and installation height.





In urban areas non-laminar wind flow occurs as a result of turbulence due primarily to adjacent buildings. There is growing evidence of urban wind turbines failing to perform in line with manufacturer's estimated outputs and as a result wind turbines are likely to produce only modest power outputs with corresponding low carbon dioxide emission reduction within urban sites.

For the reasons detailed above wind turbines are not considered viable for the development.

6.04 Photovoltaic Cells

Photovoltaic (PV) panels utilise the sun's energy to generate electricity. The optimum location for PV panels is south facing at an approximate 30° inclination angle in areas where they are not subjected to shade.





Each of the three illustrative units has unshaded roof area that could be utilised for PV panels. The industrial/warehouse units have been modelled in the lean option with 15% roof lights and thus the amount of roof area available to use for PV is partly restricted. That aside it is considered that PV's could be successfully integrated at roof level running with the inclined roof angles to the industrial/warehouse units.

The following quantity of PV is required to meet the target 10% reduction from onsite renewable energy technology' when combined with the carbon emission reductions from the air source heat pumps shown in section 6.07 of this report, and to meet the aspiration to achieve the mandatory minimum score of 5 from BREEAM credit Ene01 which is required for a rating of excellent. For clarity the 10% reduction from onsite LZCs is achieved by the ASHPs alone for Unit 3 and hence no PV is proposed to this illustrative unit.

	Units	Unit 1	Unit 2	Unit 3
PV Panel Area	m ²	70	50	0
Approximate Peak Electrical Output	kWp	13.02	9.30	0.00
Annual Carbon Emission Reduction	kgCO ₂ /m ²	0.35	0.87	0.00
	Tonnes CO ₂ /year	6.11	4.35	0.00
Offset of Lean CO ₂ Emissions	%	2.1	5.6	0.0



6.05 Biomass

Biomass is considered to be a renewable fuel source as the CO₂ absorbed during the growth period is assessed as being approximately equal to the CO₂ emitted during combustion and hence deemed carbon neutral. Biomass for boilers is typically wood, either in chip or pellet form.

Biomass boilers require fuel storage together with associated transportation and delivery to the store location. Biomass boilers also increase the NO_x emissions when compared to gas fired boilers.



As noted in section 5.03 of this report the base heating demand for the industrial units is low. The plant space requirements for a biomass installation are large when compared to a gas fired boiler installation. Therefore, utilising a biomass solution would be an inefficient use of space for this development.

A communal heating system is not appropriate for the commercial development, see section 5.02 of this report. When considering a biomass solution this is exacerbated by the additional plant area requirements for the fuel storage and delivery.

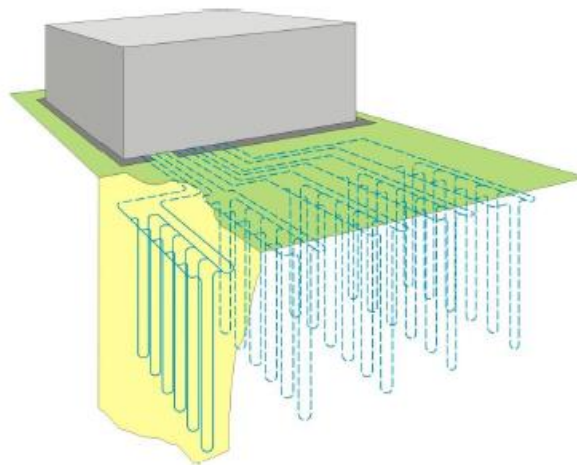
For this development there is no realistic space within the overall development for the fuel storage together with the site constraints related to the associated delivery requirements. In addition there are on-going concerns with regard to the potential impact on local air quality.



For the reasons defined above the use of biomass is not considered viable for the development.

6.06 Ground Source Heating and Cooling

Ground source heating and cooling systems utilise the principle during heating mode of upgrading heat from the ground to a usable temperature and during cooling mode of rejecting heat from the building into the ground. There are two primary methods utilising either open or closed loop systems.



The open loop system extracts water, typically from the chalk aquifer, and uses this water in either the heating or cooling process before rejecting this heat back to the aquifer in a separate borehole. The open loop system requires licence approval from the Environment Agency that typically has a 10 year duration.

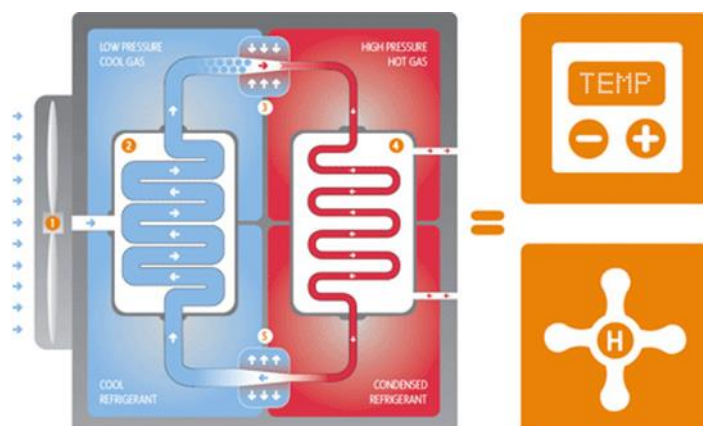
The closed loop system dissipates heat to or extracts heat from the ground via pipework circuits that are typically inserted into vertical boreholes. These generally do not require Environment Agency licences as no extraction of water from the aquifer takes place.

Generally, for both the open and closed loop options heat pumps are used in order to generate the heating and cooling water temperatures needed within a building.

GSHP are technically viable for use at the development. However, as air source heat pumps in their variable refrigerant flow (VRF) format are also technically viable the GSHP solution, which is considerably more expensive to install, has not been considered viable for the development.

6.07 Air Source Heating and Cooling

Air sourced heat pump (ASHP) works on the same principals as a ground source heat pump (GSHP) however the medium in which heat is extracted is the external air rather than the ground. The ASHP can be reversed to provide cooling when required. ASHP will generally have a lower seasonal coefficient of performance when compared to GSHP.



Air source heat pumps in their variable refrigerant volume (VRF) format are suitable for use in the development. They will provide the heating and comfort cooling to the office and core areas in each unit.

The COPs and SEERs incorporated into the thermal model are as follows:

COP	SEER
4.0	5.0

The thermal modelling has indicated that the predicted carbon emission reductions and annual electricity input to the ASHPs are:

		Unit 1	Unit 2	Unit 3
Predicted annual carbon emission reduction	kgCO ₂ /m ²	1.39	0.78	2.31
	Tonnes CO ₂ /year	24.02	3.91	13.71
Offset of the lean scheme CO ₂ emissions.	%	8.41%	5.00%	10.84%
ASHP electricity input	kWh/year	14,359	1,766	7,733

6.08 Fuel Cell

A fuel cell technology essentially converts chemical energy into both electrical and heat energy. The cell needs to be continually supplied with hydrogen (derived from either a piped or storage source) and oxygen (derived from air) which are combine and the chemical reaction produces electrical energy, heat energy and water vapour.

The fuel cell requires a hydrogen fuel source that can either be from a piped source (not currently available) or from stored gas. However, the more usual approach currently in the UK is to use natural gas in order to generate the hydrogen required to operate the fuel cell.

Fuel cells have various commercial and technical limitations. There is a high initial capital cost together with there being few established suppliers and a very limited specialist design, installation and maintenance capabilities. Certain fuel cell elements require regular replacement imposing a significant on-going cost implication. The fuel cells themselves are generally large, heavy and require fresh air ventilation.



Due to the initial capital cost, space requirements and on-going maintenance costs fuel cells are not considered viable for this development.

6.09 Renewable Energy Analysis

The proposed renewable energy sources for the development are:

Unit 1

- Air source heat pumps - ASHPs in their variable refrigerant flow (VRF) format will provide the heating and cooling requirements of the office areas.
- Photovoltaic panels - 70 m² to provide a contribution towards the electrical demand

Unit 2

- Air source heat pumps - ASHPs in their variable refrigerant flow (VRF) format will provide the heating and cooling requirements of the office areas.
- Photovoltaic panels - 50 m² to provide a contribution towards the electrical demand

Unit 3

- Air source heat pumps - ASHPs in their variable refrigerant flow (VRF) format will provide the heating and cooling requirements of the office areas.
- Photovoltaic panels - Not required as the energy targets are met via the ASHPs without any additional PV.

6.09.01 Unit 1

The thermal model for unit 1 has been repeated incorporating the renewable energy technologies and the results are:

	Baseline Scheme (kg CO ₂ /m ² /year)	Lean Scheme (kg CO ₂ /m ² /year)	LZC Scheme (kg CO ₂ /m ² /year)
Heating	5.75	4.01	3.97
Cooling	0.56	0.80	0.43
Fans and pumps	0.84	1.47	0.50
Lighting	9.74	4.62	4.62
Domestic Hot Water	3.77	5.60	5.60
Displaced Electricity	0.00	0.00	-0.35
Part L2A : 2013 Total	20.66	16.50	14.76
Unregulated Power	4.67	4.67	4.67
Total	25.33	21.17	19.43



	CO ₂ Emission (Tonnes per annum)	
	Regulated	Unregulated
Baseline Scheme	357.83	438.72
Lean Scheme	285.70	366.60
Clean Scheme	285.70	366.60
Green Scheme	255.57	336.47

	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per year	% Improvement
Lean Scheme savings	72.12	20.2%
Clean Scheme savings	0.00	0.0%
Green Scheme savings	30.13	10.5%
Total cumulative savings	102.25	28.6%

6.09.02 Unit 2

The thermal model for unit 2 has been repeated incorporating the renewable energy technologies and the results are:

	Baseline Scheme (kg CO ₂ /m ² /year)	Lean Scheme (kg CO ₂ /m ² /year)	LZC Scheme (kg CO ₂ /m ² /year)
Heating	8.81	3.94	3.84
Cooling	0.37	0.34	0.18
Fans and pumps	0.70	0.91	0.39
Lighting	9.58	4.94	4.94
Domestic Hot Water	3.67	5.47	5.47
Displaced Electricity	0.00	0.00	-0.87
Part L2A : 2013 Total	23.13	15.60	13.95
Unregulated Power	4.67	4.67	4.67
Total	27.80	20.27	18.62

	CO ₂ Emission (Tonnes per annum)	
	Regulated	Unregulated
Baseline Scheme	115.92	139.34
Lean Scheme	78.20	101.62
Clean Scheme	78.20	101.62
Green Scheme	69.94	93.35

	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per year	% Improvement
Lean Scheme savings	37.72	32.5%
Clean Scheme savings	0.00	0.0%



	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per year	% Improvement
Green Scheme savings	8.26	10.6%
Total cumulative savings	45.98	39.7%

6.09.03 Unit 3

The thermal model for unit 3 has been repeated incorporating the renewable energy technologies and the results are:

	Baseline Scheme (kg CO ₂ /m ² /year)	Lean Scheme (kg CO ₂ /m ² /year)	LZC Scheme (kg CO ₂ /m ² /year)
Heating	6.93	3.42	3.32
Cooling	0.85	1.26	0.68
Fans and pumps	1.50	2.51	0.88
Lighting	10.52	5.38	5.38
Domestic Hot Water	5.92	8.79	8.79
Displaced Electricity	0.00	0.00	0.00
Part L2A : 2013 Total	25.72	21.36	19.05
Unregulated Power	4.67	4.67	4.67
Total	30.39	26.03	23.72

	CO ₂ Emission (Tonnes per annum)	
	Regulated	Unregulated
Baseline Scheme	152.30	179.96
Lean Scheme	126.50	154.16
Clean Scheme	126.50	154.16
Green Scheme	112.79	140.45

	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per year	% Improvement
Lean Scheme savings	25.80	16.9%
Clean Scheme savings	0.00	0.0%
Green Scheme savings	13.71	10.8%
Total cumulative savings	39.51	25.9%



6.09.04 Development

The combined thermal model analysis for the development gives the following results:

	Baseline Scheme (kg CO ₂ /m ² /year)	Lean Scheme (kg CO ₂ /m ² /year)	LZC Scheme (kg CO ₂ /m ² /year)
Heating	6.54	3.88	3.81
Cooling	0.59	0.81	0.44
Fans and pumps	0.95	1.59	0.56
Lighting	9.87	4.83	4.83
Domestic Hot Water	4.20	6.24	6.24
Displaced Electricity	0.00	0.00	-0.37
Part L2A : 2013 Total	22.16	17.36	15.51
Unregulated Power	4.67	4.67	4.67
Total	26.83	22.03	20.18

	CO ₂ Emission (Tonnes per annum)	
	Regulated	Unregulated
Baseline Scheme	626.06	758.02
Lean Scheme	490.41	622.38
Clean Scheme	490.41	622.38
Green Scheme	438.31	570.27

	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per year	% Improvement
Lean Scheme savings	135.65	21.67%
Clean Scheme savings	0.00	0.00%
Green Scheme savings	52.10	10.62%
Total cumulative savings	187.75	29.99%



7.00 OVERALL BUILDING ANALYSIS

7.01 Carbon Reduction – Unit 1

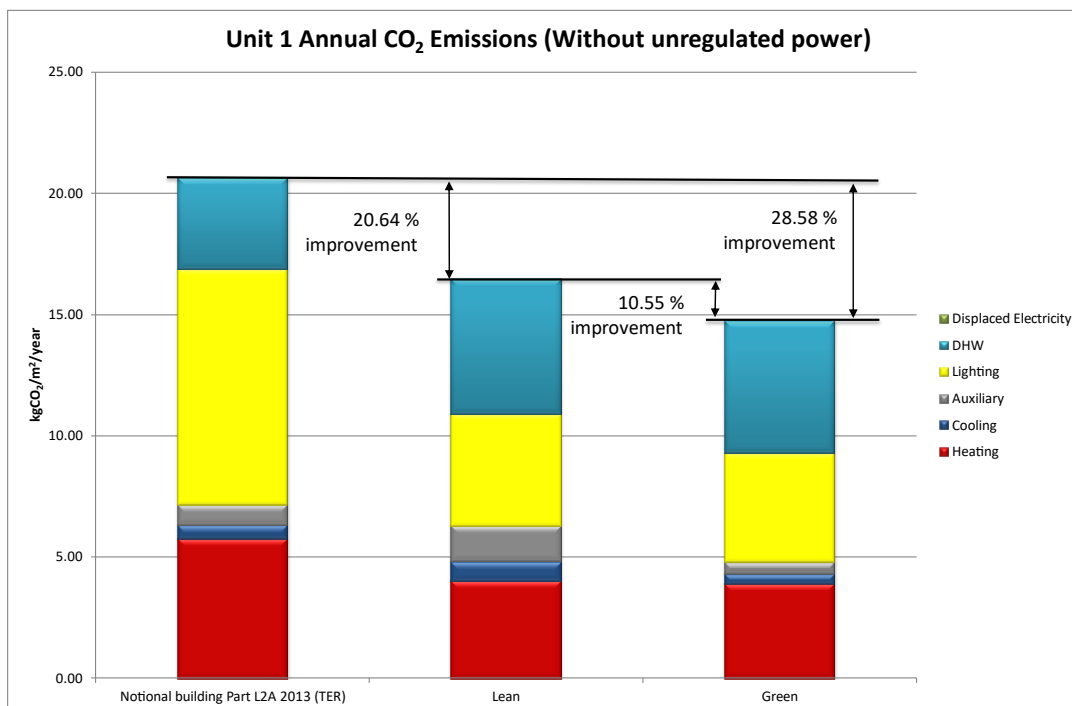
The overall building analysis for Unit 1 can then be summarised as follows:

	Tonnes CO2 /year		
	Baseline Scheme	Lean Scheme (with passive/low energy)	LZC Scheme
Building Regulations Compliant	357.83	285.70	255.57
Allowing for Un-regulated Uses	438.72	366.60	336.47

These values are shown in diagrammatic form below that shows the following principles:

	Regulated Energy	
	Lean Scheme (with passive/low energy)	LZC Scheme
Improvement over baseline scheme	20.16%	28.58%
Improvement over lean scheme	-	10.55%

	Unregulated Energy	
	Lean Scheme (with passive/low energy)	LZC Scheme
Improvement over baseline scheme	16.44%	23.31%
Improvement over lean scheme	-	8.22%



Based on the regulated power results indicated above the proposed scheme incorporating renewable energy technologies provides a carbon emissions reduction of 28.58 % when compared to the baseline Building Regulation 2013 (TER) compliant scheme.

The carbon emission savings as a result of the proposed measures based on the current design are predicted as follows:

	CO ₂ Emission (tonnes CO ₂ /year)	With Un-Regulated Uses CO ₂ Emission (tonnes CO ₂ /year)
Baseline scheme	357.83	438.72
LZC Scheme	255.57	336.47
Saving over baseline scheme	102.25	102.25

When the above results are put into the BREEAM credit Ene01 calculator a score of 5 is result and hence the mandatory minimum of 5 credits required for an overall rating of excellent is achieved.

7.02 Carbon Reduction – Unit 2

The overall building analysis for unit 2 can then be summarised as follows:

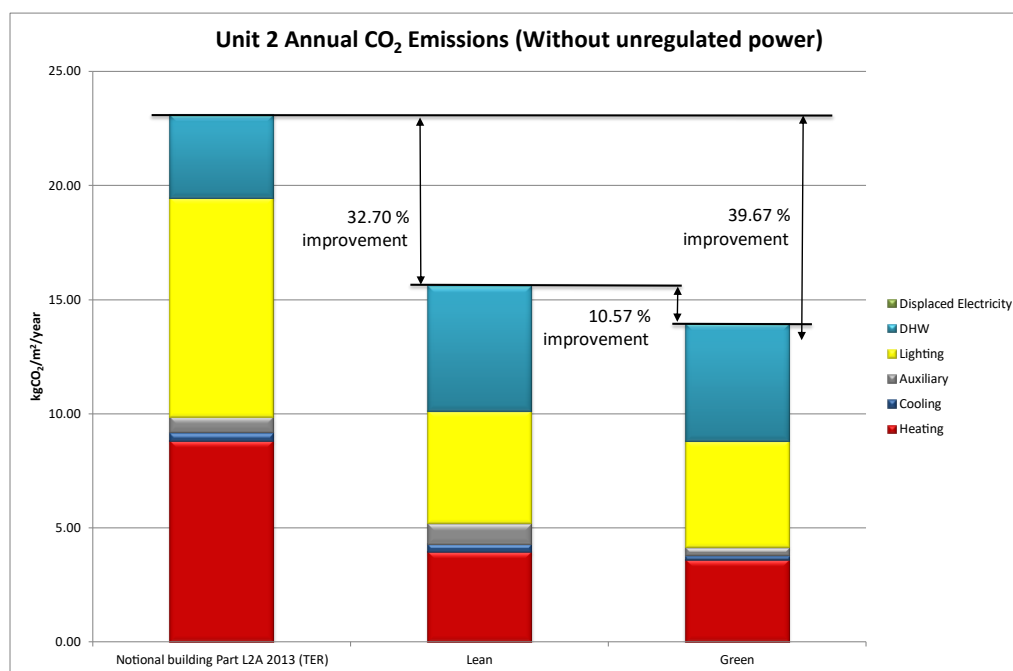
	Tonnes CO ₂ /year		
	Baseline Scheme	Lean Scheme (with passive/low energy)	LZC Scheme
Building Regulations Compliant	115.92	78.20	69.94
Allowing for Un-regulated Uses	139.34	101.62	93.35



These values are shown in diagrammatic form below that shows the following principles:

	Regulated Energy	
	Lean Scheme (with passive/low energy)	LZC Scheme
Improvement over baseline scheme	32.54%	39.67%
Improvement over lean scheme	-	10.57%

	Unregulated Energy	
	Lean Scheme (with passive/low energy)	LZC Scheme
Improvement over baseline scheme	27.07%	33.00%
Improvement over lean scheme	-	8.13%



Based on the regulated power results indicated above the proposed scheme incorporating renewable energy technologies provides a carbon emissions reduction of 39.67% when compared to the baseline Building Regulation 2013 (TER) compliant scheme.

The carbon emission savings as a result of the proposed measures based on the current design are predicted as follows:

	Regulated Uses CO ₂ Emission (tonnes CO ₂ /year)	With Un-Regulated Uses CO ₂ Emission (tonnes CO ₂ /year)
Baseline scheme	115.92	139.34



	Regulated Uses CO₂ Emission (tonnes CO₂/year)	With Un-Regulated Uses CO₂ Emission (tonnes CO₂/year)
LZC Scheme	69.94	93.35
Saving over baseline scheme	45.98	45.98

When the above results are put into the BREEAM credit Ene01 calculator a score of 7 is result and hence the mandatory minimum of 5 credits required for an overall rating of excellent is achieved.

7.03 Carbon Reduction – Unit 3

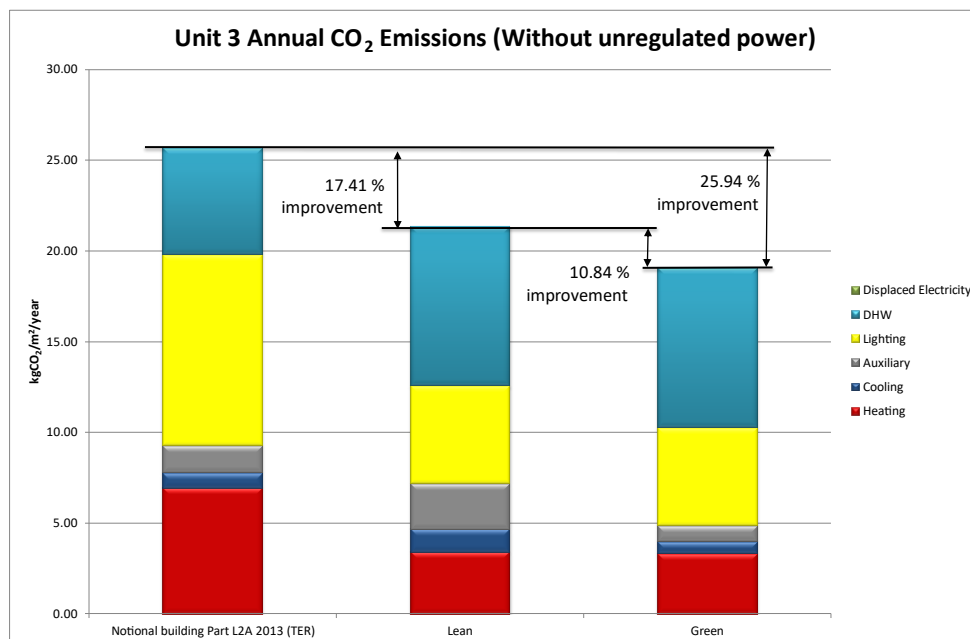
The overall building analysis for unit 3 can then be summarised as follows:

	Tonnes CO₂/year		
	Baseline Scheme	Lean Scheme (with passive/low energy)	LZC Scheme
Building Regulations Compliant	152.30	126.50	112.79
Allowing for Un-regulated Uses	179.96	154.16	140.45

These values are shown in diagrammatic form below that shows the following principles:

	Regulated Energy	
	Lean Scheme (with passive/low energy)	LZC Scheme
Improvement over baseline scheme	16.94%	25.94%
Improvement over lean scheme	-	10.84%

	Unregulated Energy	
	Lean Scheme (with passive/low energy)	LZC Scheme
Improvement over baseline scheme	14.34%	21.95%
Improvement over lean scheme	-	8.89%



Based on the regulated power results indicated above the proposed scheme incorporating renewable energy technologies provides a carbon emissions reduction of 25.94% when compared to the baseline Building Regulation 2013 (TER) compliant scheme.

The carbon emission savings as a result of the proposed measures based on the current design are predicted as follows:

	Regulated Uses CO ₂ Emission (tonnes CO ₂ /year)	With Un-Regulated Uses CO ₂ Emission (tonnes CO ₂ /year)
Baseline scheme	152.30	179.96
LZC Scheme	112.79	140.45
Saving over baseline scheme	39.51	39.51

When the above results are put into the BREEAM credit Ene01 calculator a score of 6 is result and hence the mandatory minimum of 5 credits required for an overall rating of excellent is achieved.

7.04 Carbon Reduction – Illustrative Development

The overall building analysis for the development can then be summarised as follows:

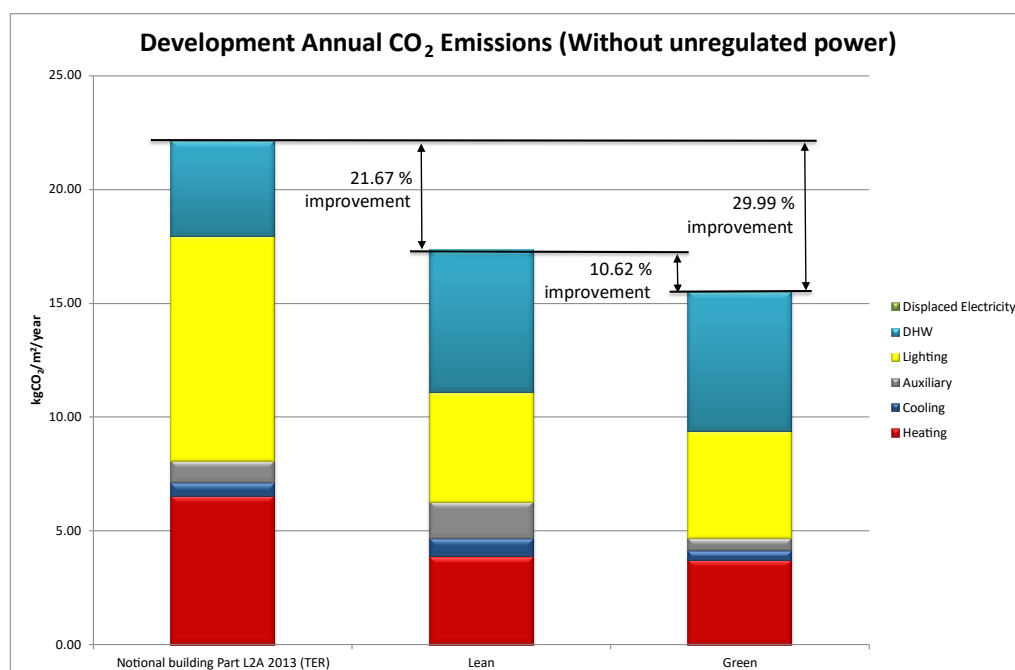
	Tonnes CO ₂ /year		
	Baseline Scheme	Lean Scheme (with passive/low energy)	LZC Scheme
Building Regulations Compliant	626.06	490.41	438.31
Allowing for Un-regulated Uses	758.02	622.38	570.27



These values are shown in diagrammatic form below that shows the following principles:

	Regulated Energy	
	Lean Scheme (with passive/low energy)	LZC Scheme
Improvement over baseline scheme	21.67%	29.99%
Improvement over lean scheme	-	10.62%

	Unregulated Energy	
	Lean Scheme (with passive/low energy)	LZC Scheme
Improvement over baseline scheme	17.89%	24.77%
Improvement over lean scheme	-	8.37%



Based on the regulated power results indicated above the proposed scheme incorporating renewable energy technologies provides a carbon emissions reduction of 29.99% when compared to the baseline Building Regulation 2013 (TER) compliant scheme.

The carbon emission savings as a result of the proposed measures based on the current design are predicted as follows:

	Regulated Uses CO ₂ Emission (tonnes CO ₂ /year)	With Un-Regulated Uses CO ₂ Emission (tonnes CO ₂ /year)
Baseline scheme	626.06	758.02
LZC Scheme	438.31	570.27
Saving over baseline scheme	187.75	187.75



7.05 Carbon Reduction – Framework Table

As can be seen from the overall results for the assessment of the illustrative building types, the preceding report sections all three of the illustrative unit sizes and the overall development comply with the energy strategy targets of:

- Building Regulations Part L compliance by the energy efficiency measures alone.
- A 10% carbon emission reduction from onsite LZCs.
- When the above two measures are combined, they give the mandatory minimum score of 5 for an excellent rating from BREEAM credit Ene01.

The table below summarises the carbon dioxide emission reductions against each illustrative unit baseline emissions after implementing the previously discussed energy efficiency and renewable technology measures.

CO₂ Emission Figures for Building Options Modelled:

Building Type	Building Area (Gross Internal Area)	Baseline Annual Emissions (kgCO ₂ /m ²)	Reduced Annual Emissions (kgCO ₂ /m ²)	CO ₂ Emission Saving from Baseline (%)	BREEAM Ene01 score
Unit 1 Detached B1c / B2 / B8 Industrial/Warehouse	185,970 ft ² (17,277 m ²)	20.66	14.76	28.58%	5
Unit 2 Attached B1c / B2 / B8 Industrial/Warehouse	52,580 ft ² (4,885 m ²)	23.13	13.95	39.67%	7
Unit 3 Attached B1c / B2 / B8 Industrial/Warehouse	57,145 ft ² (5,309 m ²)	25.72	19.05	25.94%	6

The above percentage emission reductions for the various building options have been assessed and incorporated into a Framework Table, see below, for the building uses and size ranges referred to in section 4.01.

The intent for the Framework Table is to apply the targets set for this energy strategy i.e., Building Regulations Part L compliance by the energy efficiency measures alone, a 10% carbon emission reduction from onsite LZCs and these two measures are combined, they give the mandatory minimum score of 5 for an excellent rating from BREEAM credit Ene01. This will allow the Applicant maximum future flexibility in design and layout and to still to exceed the adopted planning policy carbon reduction target.

Framework Table:

Building Type	Size (Gross Internal Area)	CO ₂ Reduction Target
B1c / B2 / B8 Industrial / Warehouse	18,000 - 55,000 ft ² (1,672 to 5,110 m ²)	Part L compliance from energy efficiency measures alone, a 10% reduction on regulated energy from onsite LZCs plus a minimum score of 5 for BREEAM credit Ene01
	55,000 – 125,000 ft ² (5,110 – 11,613 m ²)	
	Over 125,000 ft ² (11,613 m ²)	



8.00 CONCLUSIONS

In line with the relevant planning policies and guidelines the energy strategy for the proposed development has adopted a hierarchical approach of using passive and low energy design technologies to reduce the baseline energy demand and hence CO₂ emissions followed by the application of low and zero carbon technologies as appropriate.

The focus of the energy strategy is on CO₂ reduction from the building by adopting a highly efficient building envelope solution together with high efficiency mechanical and electrical services incorporating heat recovery. The renewable energy technologies assessment is based on using solutions that are technically proven with low maintenance implications taking into account the energy efficiency strategies being proposed in the current outline design.

The analysis has shown that by incorporating passive and low energy design measures there is a predicted reduction in each individual illustrative unit and the three unit illustrative development's annual CO₂ emissions, as indicated in the table below, from the baseline scheme.

	Regulated CO ₂ Savings (Passive)	
	Tonnes CO ₂	%
Unit 1	72.12	20.16%
Unit 2	37.72	32.54%
Unit 3	25.80	16.94%
Development	135.65	21.67%

This is achieved by the following elements:

- High performance glazing
- Improved building fabric
- Low building air leakage rate of 3.0 m³/hr/m² @ 50 Pa, which represents a 70% improvement over the minimum 2013 Building Regulations requirement has been used.
- Variable speed fans and pumps
- Low energy lighting
- Automatic lighting control with occupancy and daylight dimming controls

Therefore, each illustrative unit and the illustrative development exceed the Building Regulations Part L2A:2013 carbon emission reduction target by passive energy efficiency measures alone.

The decentralised heating, cooling and power assessment has indicated that the application of these systems and technologies are either not available to the scheme or are not viable for the scheme.

The potential renewable energy technologies have been assessed taking into account the particular development constraints. The strategy is to utilise:

- Variable refrigerant flow (VRF) air source heat pumps to provide the heating and cooling requirements.
- Photovoltaic cells to provide a contribution to the electrical demand.



The analysis has shown that by incorporating these renewable energy technologies in addition to the passive and low energy design measures there is a predicted reduction of annual CO₂ emissions from the illustrative three unit scheme as indicated in the table below:

	Regulated CO ₂ Savings	
	Tonnes CO ₂	%
Unit 1	102.25	28.58%
Unit 2	45.98	39.67%
Unit 3	39.51	25.94%
Development	187.75	29.99%

When the above results are put into the BREEAM credit Ene01 calculator the score for each unit is as follows:

	BREEAM Ene01 Score
Unit 1	5
Unit 2	7
Unit 3	6

Hence, the energy strategy target of achieving the mandatory minimum of 5 credits required for an overall rating of excellent is achieved.

As there are no specific carbon emission reduction targets in the Havant Borough Council adopted Core Strategy or the emerging Local Plan, the overall conclusion of this energy strategy is based on the ability of the illustrative units and the overall illustrative development of meeting the Applicants targets of:

- Building Regulations Part L compliance by the energy efficiency measures alone.
- A 10% carbon emission reduction from onsite LZCs.
- When the above two measures are combined, they give the mandatory minimum score of 5 for an excellent rating from BREEAM credit Ene01.

All the illustrative units and the overall illustrative development meet these targets.

The results from the assessment of the illustrative unit types and sizes indicates that by applying the energy efficiency measures and the proposed LZC technologies that a framework table for the proposed performance of the unit types and sizes that could be developed at the site is as follows:

Building Type	Size (Gross Internal Area)	CO ₂ Reduction Target
B1c / B2 / B8 Industrial / Warehouse	18,000 - 55,000 ft ² (1,672 to 5,110 m ²)	Part L compliance from energy efficiency measures alone, a 10% reduction on regulated energy from onsite LZCs plus a minimum score of 5 for BREEAM credit Ene01
	55,000 – 125,000 ft ² (5,110 – 11,613 m ²)	
	Over 125,000 ft ² (11,613 m ²)	



APPENDIX 1 – BRUKL Reports

Unit 1 – Lean

Unit 1 – Green

Unit 2 – Lean

Unit 2 – Green

Unit 3 – Lean

Unit 3 – Green



APPENDIX 2 – Illustrative 3 unit site layout

Project name

Shell and Core

Harts Farm Rd Unit 1 - Lean

As designed

Date: Tue Feb 09 15:14:09 2021

Administrative information

Building Details

Address: Unit 1, Harts Farm Way, HAVANT,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.1"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.1

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Jeremy Holgate

Telephone number: 01932 781641

Address: Watkins Payne Partnership, Sunbury-on-Thames,
TW16 7AHCriterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	20.7
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	20.7
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	16.5
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	External Wall
Floor	0.25	0.22	0.22	Ground Floor
Roof	0.25	0.18	0.18	Roof
Windows***, roof windows, and rooflights	2.2	1.33	1.4	Spandrel Hi
Personnel doors	2.2	2.2	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	1.5	Vehicle Door
High usage entrance doors	3.5	-	-	No high usage entrance doors in project
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)] * There might be more than one surface where the maximum U-value occurs. ** 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. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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- Electric & Extract (18 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

2- Electric NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

3- Radiant NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
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					NO

4- FCU MVHR (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3	-	-	0.74
Standard value	0.91*	2.55	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

5- FCU NV (U1_Ware_Reception 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3	-	-	-
Standard value	0.91*	2.55	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

1- DHW Instant Elec

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.01
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

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	1.9	1.6	0.5	1.1	0.5	1			
U1_Ware_Toilet 1	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 2	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 3	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Office 1	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U1_Ware_Reception 1	-	-	-	-	-	-	-	0.5	-	-	-	N/A
U1_Shower 1	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 4	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Office 2	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U1_Ware_Office 3	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U1_Ware_Office 4	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U1_Shower 2	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 3	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Office 5	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U1_Ware_Office 6	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U1_Ware_Toilet 5	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 6	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 7	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 8	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 9	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 4	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 5	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 6	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 7	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 8	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 9	-	-	0.5	-	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
U1_Ware_WareStore 1	YES
U1_Ware_WareStore 3	YES

Shell and core configuration

Zone	Assumed shell?
U1_Ware_Circulation 1	NO
U1_Ware_Circulation 2	NO
U1_Ware_Toilet 1	NO
U1_Ware_Toilet 2	NO
U1_Ware_Toilet 3	NO
U1_Ware_Office 1	NO
U1_Ware_Reception 1	NO
U1_Shower 1	NO
U1_Ware_Circulation 3	NO
U1_Ware_Toilet 4	NO
U1_Ware_WareStore 2	YES
U1_Ware_Office 2	NO
U1_Ware_Office 3	NO
U1_Ware_Office 4	NO
U1_Shower 2	NO
U1_Shower 3	NO
U1_Ware_Circulation 4	NO
U1_Ware_Circulation 5	NO
U1_Storage 1	NO
U1_Storage 2	NO
U1_Ware_Circulation 6	NO
U1_Ware_Circulation 7	NO
U1_Ware_Circulation 8	NO
U1_Ware_Circulation 9	NO
U1_Ware_Circulation 10	NO
U1_Ware_Circulation 11	NO
U1_Ware_Circulation 12	NO
U1_Ware_Circulation 13	NO
U1_Ware_Circulation 14	NO
U1_Ware_Circulation 15	NO
U1_Ware_Circulation 16	NO
U1_Ware_Circulation 17	NO
U1_Ware_Circulation 18	NO
U1_Ware_Office 5	NO
U1_Ware_Office 6	NO
U1_Ware_Toilet 5	NO
U1_Ware_Toilet 6	NO
U1_Ware_Toilet 7	NO
U1_Ware_Toilet 8	NO
U1_Ware_Toilet 9	NO
U1_Shower 4	NO
U1_Shower 5	NO
U1_Shower 6	NO
U1_Shower 7	NO
U1_Shower 8	NO
U1_Shower 9	NO
U1_Storage 3	NO

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
U1_Ware_WareStore 1		100	-	-	62984
U1_Ware_WareStore 3		100	-	-	1691
U1_Ware_Circulation 1		-	80	-	309
U1_Ware_Circulation 2		-	80	-	139
U1_Ware_Toilet 1		-	80	-	95
U1_Ware_Toilet 2		-	80	-	98
U1_Ware_Toilet 3		-	80	-	36
U1_Ware_Office 1		90	-	-	2565
U1_Ware_Reception 1		-	80	60	60
U1_Shower 1		-	80	-	52
U1_Ware_Circulation 3		-	80	-	113
U1_Ware_Toilet 4		-	80	-	95
U1_Ware_WareStore 2		100	-	-	2035
U1_Ware_Office 2		90	-	-	2702
U1_Ware_Office 3		90	-	-	348
U1_Ware_Office 4		90	-	-	2505
U1_Shower 2		-	80	-	17
U1_Shower 3		-	80	-	9
U1_Ware_Circulation 4		-	80	-	20
U1_Ware_Circulation 5		-	80	-	9
U1_Storage 1		80	-	-	10
U1_Storage 2		80	-	-	10
U1_Ware_Circulation 6		-	80	-	67
U1_Ware_Circulation 7		-	80	-	63
U1_Ware_Circulation 8		-	80	-	37
U1_Ware_Circulation 9		-	80	-	38
U1_Ware_Circulation 10		-	80	-	20
U1_Ware_Circulation 11		-	80	-	9
U1_Ware_Circulation 12		-	80	-	68
U1_Ware_Circulation 13		-	80	-	61
U1_Ware_Circulation 14		-	80	-	37
U1_Ware_Circulation 15		-	80	-	37
U1_Ware_Circulation 16		-	80	-	20
U1_Ware_Circulation 17		-	80	-	9
U1_Ware_Circulation 18		-	80	-	66
U1_Ware_Office 5		90	-	-	2698
U1_Ware_Office 6		90	-	-	346
U1_Ware_Toilet 5		-	80	-	36
U1_Ware_Toilet 6		-	80	-	69
U1_Ware_Toilet 7		-	80	-	93
U1_Ware_Toilet 8		-	80	-	35
U1_Ware_Toilet 9		-	80	-	67

General lighting and display lighting		Luminous efficacy [lm/W]			
Zone name		Luminaire	Lamp	Display lamp	General lighting [W]
	Standard value	60	60	22	
U1_Shower 4		-	80	-	18
U1_Shower 5		-	80	-	17
U1_Shower 6		-	80	-	9
U1_Shower 7		-	80	-	18
U1_Shower 8		-	80	-	17
U1_Shower 9		-	80	-	9
U1_Storage 3		80	-	-	10

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
U1_Ware_WareStore 1	YES (+11%)	NO
U1_Ware_WareStore 3	NO (-28%)	NO
U1_Ware_Office 1	NO (-70%)	NO
U1_Ware_Reception 1	YES (+9%)	NO
U1_Ware_WareStore 2	NO (-63%)	NO
U1_Ware_Office 2	NO (-86%)	NO
U1_Ware_Office 3	NO (-66%)	NO
U1_Ware_Office 4	NO (-69%)	NO
U1_Ware_Office 5	NO (-85%)	NO
U1_Ware_Office 6	NO (-66%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	17318	17318
External area [m ²]	39282	39282
Weather	SOU	SOU
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	11798	13255
Average U-value [W/m ² K]	0.3	0.34
Alpha value* [%]	1.52	1.52

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

Building Use

% Area Building Type

	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
100	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	17.7	26.23
Cooling	1.54	1.11
Auxiliary	2.84	1.66
Lighting	8.89	19.25
Hot water	10.78	11.83
Equipment*	31.04	31.04
TOTAL **	41.76	60.08

* 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	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	73.01	100.48
Primary energy* [kWh/m ²]	96.6	110.83
Total emissions [kg/m ²]	16.5	20.7

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

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] Other local room heater - unfanned, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
Actual	110.7	0	30.8	0	25.9	1	0	1	0	
Notional	140.2	0	47.6	0	31.1	0.82	0	----	----	
[ST] Other local room heater - unfanned, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
Actual	84.4	0	23.5	0	0	1	0	1	0	
Notional	82.7	0	28.1	0	0	0.82	0	----	----	
[ST] Multiburner radiant heaters, [HS] Radiant heater, [HFT] Natural Gas, [CFT] Electricity										
Actual	62.4	0	19	0	0	0.91	0	0.91	0	
Notional	92.6	0	29.9	0	0	0.86	0	----	----	
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
Actual	10.3	143.8	3.5	14.8	27	0.82	2.7	0.91	3	
Notional	15.6	154.6	5.3	11.9	15.6	0.82	3.6	----	----	
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
Actual	48.1	1532.1	16.3	157.6	48.7	0.82	2.7	0.91	3	
Notional	17.8	273.2	6	21.1	19	0.82	3.6	----	----	

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.26	External Wall
Floor	0.2	0.22	Ground Floor
Roof	0.15	0.18	Roof
Windows, roof windows, and rooflights	1.5	1.3	Rooflight
Personnel doors	1.5	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	Vehicle Door
High usage entrance doors	1.5	-	No high usage entrance doors in project
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Project name

Shell and Core

Harts Farm Rd Unit 1 - Green PV70

As designed

Date: Tue Feb 09 15:40:54 2021

Administrative information

Building Details

Address: Unit 1, Harts Farm Way, HAVANT,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.1"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.1

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Jeremy Holgate

Telephone number: 01932 781641

Address: Watkins Payne Partnership, Sunbury-on-Thames,
TW16 7AHCriterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	20.1
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	20.1
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	14.8
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	External Wall
Floor	0.25	0.22	0.22	Ground Floor
Roof	0.25	0.18	0.18	Roof
Windows***, roof windows, and rooflights	2.2	1.33	1.4	Spandrel Hi
Personnel doors	2.2	2.2	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	1.5	Vehicle Door
High usage entrance doors	3.5	-	-	No high usage entrance doors in project
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)]				
* There might be more than one surface where the maximum U-value occurs. ** 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. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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- Electric & Extract (18 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

2- Electric NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

3- VRF MVHR (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	-	0.74
Standard value	2.5*	2.6	N/A	N/A	0.5
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					

4- VRF NV (U1_Ware_Reception 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	-	-
Standard value	2.5*	2.6	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. For types <=12 kW output, refer to EN 14825 for limiting standards.					

5- Radiant NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
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					NO

1- DHW Instant

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

2- HWS POU

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.01
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

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	1.9	1.6	0.5	1.1	0.5	1			
U1_Ware_Toilet 1	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 2	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 3	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Office 1	-	-	-	1.9	-	-	-	-	-	-	-	N/A
U1_Shower 1	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 4	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Office 2	-	-	-	1.9	-	-	-	-	-	-	-	N/A
U1_Ware_Office 3	-	-	-	1.9	-	-	-	-	-	-	-	N/A
U1_Ware_Office 4	-	-	-	1.9	-	-	-	-	-	-	-	N/A
U1_Shower 2	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 3	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Office 5	-	-	-	1.9	-	-	-	-	-	-	-	N/A
U1_Ware_Office 6	-	-	-	1.9	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 5	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 6	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 7	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 8	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Ware_Toilet 9	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 4	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 5	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 6	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 7	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 8	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U1_Shower 9	-	-	0.5	-	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
U1_Ware_WareStore 1	YES
U1_Ware_WareStore 3	YES
U1_Ware_Circulation 1	NO

Shell and core configuration

Zone	Assumed shell?
U1_Ware_Circulation 2	NO
U1_Ware_Toilet 1	NO
U1_Ware_Toilet 2	NO
U1_Ware_Toilet 3	NO
U1_Ware_Office 1	NO
U1_Ware_Reception 1	NO
U1_Shower 1	NO
U1_Ware_Circulation 3	NO
U1_Ware_Toilet 4	NO
U1_Ware_WareStore 2	YES
U1_Ware_Office 2	NO
U1_Ware_Office 3	NO
U1_Ware_Office 4	NO
U1_Shower 2	NO
U1_Shower 3	NO
U1_Ware_Circulation 4	NO
U1_Ware_Circulation 5	NO
U1_Storage 1	NO
U1_Storage 2	NO
U1_Ware_Circulation 6	NO
U1_Ware_Circulation 7	NO
U1_Ware_Circulation 8	NO
U1_Ware_Circulation 9	NO
U1_Ware_Circulation 10	NO
U1_Ware_Circulation 11	NO
U1_Ware_Circulation 12	NO
U1_Ware_Circulation 13	NO
U1_Ware_Circulation 14	NO
U1_Ware_Circulation 15	NO
U1_Ware_Circulation 16	NO
U1_Ware_Circulation 17	NO
U1_Ware_Circulation 18	NO
U1_Ware_Office 5	NO
U1_Ware_Office 6	NO
U1_Ware_Toilet 5	NO
U1_Ware_Toilet 6	NO
U1_Ware_Toilet 7	NO
U1_Ware_Toilet 8	NO
U1_Ware_Toilet 9	NO
U1_Shower 4	NO
U1_Shower 5	NO
U1_Shower 6	NO
U1_Shower 7	NO
U1_Shower 8	NO
U1_Shower 9	NO
U1_Storage 3	NO

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
U1_Ware_WareStore 1		100	-	-	62984
U1_Ware_WareStore 3		100	-	-	1691
U1_Ware_Circulation 1		-	80	-	309
U1_Ware_Circulation 2		-	80	-	139
U1_Ware_Toilet 1		-	80	-	95
U1_Ware_Toilet 2		-	80	-	98
U1_Ware_Toilet 3		-	80	-	36
U1_Ware_Office 1		90	-	-	2565
U1_Ware_Reception 1		-	80	60	60
U1_Shower 1		-	80	-	52
U1_Ware_Circulation 3		-	80	-	113
U1_Ware_Toilet 4		-	80	-	95
U1_Ware_WareStore 2		100	-	-	2035
U1_Ware_Office 2		90	-	-	2702
U1_Ware_Office 3		90	-	-	348
U1_Ware_Office 4		90	-	-	2505
U1_Shower 2		-	80	-	17
U1_Shower 3		-	80	-	9
U1_Ware_Circulation 4		-	80	-	20
U1_Ware_Circulation 5		-	80	-	9
U1_Storage 1		80	-	-	10
U1_Storage 2		80	-	-	10
U1_Ware_Circulation 6		-	80	-	67
U1_Ware_Circulation 7		-	80	-	63
U1_Ware_Circulation 8		-	80	-	37
U1_Ware_Circulation 9		-	80	-	38
U1_Ware_Circulation 10		-	80	-	20
U1_Ware_Circulation 11		-	80	-	9
U1_Ware_Circulation 12		-	80	-	68
U1_Ware_Circulation 13		-	80	-	61
U1_Ware_Circulation 14		-	80	-	37
U1_Ware_Circulation 15		-	80	-	37
U1_Ware_Circulation 16		-	80	-	20
U1_Ware_Circulation 17		-	80	-	9
U1_Ware_Circulation 18		-	80	-	66
U1_Ware_Office 5		90	-	-	2698
U1_Ware_Office 6		90	-	-	346
U1_Ware_Toilet 5		-	80	-	36
U1_Ware_Toilet 6		-	80	-	69
U1_Ware_Toilet 7		-	80	-	93
U1_Ware_Toilet 8		-	80	-	35
U1_Ware_Toilet 9		-	80	-	67

General lighting and display lighting		Luminous efficacy [lm/W]			
Zone name		Luminaire	Lamp	Display lamp	General lighting [W]
	Standard value	60	60	22	
U1_Shower 4		-	80	-	18
U1_Shower 5		-	80	-	17
U1_Shower 6		-	80	-	9
U1_Shower 7		-	80	-	18
U1_Shower 8		-	80	-	17
U1_Shower 9		-	80	-	9
U1_Storage 3		80	-	-	10

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
U1_Ware_WareStore 1	YES (+11%)	NO
U1_Ware_WareStore 3	NO (-28%)	NO
U1_Ware_Office 1	NO (-70%)	NO
U1_Ware_Reception 1	YES (+9%)	NO
U1_Ware_WareStore 2	NO (-63%)	NO
U1_Ware_Office 2	NO (-86%)	NO
U1_Ware_Office 3	NO (-66%)	NO
U1_Ware_Office 4	NO (-69%)	NO
U1_Ware_Office 5	NO (-85%)	NO
U1_Ware_Office 6	NO (-66%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	17318	17318
External area [m ²]	39282	39282
Weather	SOU	SOU
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	11798	13255
Average U-value [W/m ² K]	0.3	0.34
Alpha value* [%]	1.52	1.52

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

Building Use

% Area Building Type

	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
100	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	17.41	25.9
Cooling	0.83	1.11
Auxiliary	0.95	0.57
Lighting	8.89	19.25
Hot water	10.78	11.83
Equipment*	31.04	31.04
TOTAL **	38.87	58.66

* 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	0.68	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	72.97	100.51
Primary energy* [kWh/m ²]	88.42	107.47
Total emissions [kg/m ²]	14.8	20.1

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

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] Other local room heater - unfanned, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
Actual	110.7	0	30.8	0	25.9	1	0	1	0	
Notional	140.2	0	47.6	0	31.1	0.82	0	----	----	
[ST] Other local room heater - unfanned, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
Actual	84.4	0	23.5	0	0	1	0	1	0	
Notional	82.7	0	28.1	0	0	0.82	0	----	----	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	10.3	143.8	0.7	8	7.9	4	5	4	5	
Notional	15.6	154.6	1.8	11.9	3.9	2.43	3.6	----	----	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	114.1	1528.4	7.9	84.9	0	4	5	4	5	
Notional	17.9	273.2	2.1	21.1	0	2.43	3.6	----	----	
[ST] Multiburner radiant heaters, [HS] Radiant heater, [HFT] Natural Gas, [CFT] Electricity										
Actual	62.4	0	19	0	0	0.91	0	0.91	0	
Notional	92.6	0	29.9	0	0	0.86	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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.26	External Wall
Floor	0.2	0.22	Ground Floor
Roof	0.15	0.18	Roof
Windows, roof windows, and rooflights	1.5	1.3	Rooflight
Personnel doors	1.5	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	Vehicle Door
High usage entrance doors	1.5	-	No high usage entrance doors in project
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Project name

Shell and Core

Harts Farm Rd Unit 2 - Lean

As designed

Date: Tue Feb 09 15:52:35 2021

Administrative information

Building Details

Address: Unit 2, Harts Farm Way, HAVANT,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.1"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.1

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Jeremy Holgate

Telephone number: 01932 781641

Address: Watkins Payne Partnership, Sunbury-on-Thames,
TW16 7AHCriterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	23.1
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	23.1
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	15.6
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	External Wall
Floor	0.25	0.22	0.22	Ground Floor
Roof	0.25	0.18	0.18	Roof (Office)
Windows***, roof windows, and rooflights	2.2	1.32	1.4	Spandrel Escape
Personnel doors	2.2	2.2	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	1.5	Vehicle Door
High usage entrance doors	3.5	-	-	No high usage entrance doors in project
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)]				
* There might be more than one surface where the maximum U-value occurs. ** 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. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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- Electric & Extract (12 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO

2- Electric NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO

3- Radiant NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
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					NO

4- FCU MVHR (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3	-	-	0.7
Standard value	0.91*	2.55	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

5- FCU NV (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3	-	-	-
Standard value	0.91*	2.55	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

1- DHW Instant

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

2- HWS POU

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.01
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

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	1.9	1.6	0.5	1.1	0.5	1		Zone	Standard
U2_Ware_Circulation 1	-	-	-	-	-	-	-	0.5	-	-	-	N/A
U2_Ware_Toilet 1	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 2	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 3	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Office 1	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U2_Ware_Office 2	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U2_Ware_Office 3	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U2_Ware_Reception 1	-	-	-	-	-	-	-	0.5	-	-	-	N/A
U2_Shower 1	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Shower 2	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 4	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Shower 3	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 5	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 6	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 7	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 8	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 9	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Office 4	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
U2_Ware_WareStore 1	YES
U2_Ware_WareStore 2	YES
U2_Ware_Circulation 1	NO
U2_Ware_Circulation 2	NO
U2_Ware_Toilet 1	NO
U2_Ware_Toilet 2	NO
U2_Ware_Toilet 3	NO
U2_Ware_Circulation 3	NO
U2_Ware_Office 1	NO
U2_Ware_Office 2	NO
U2_Ware_Office 3	NO
U2_Ware_Reception 1	NO

Shell and core configuration

Zone	Assumed shell?
U2_Shower 1	NO
U2_Shower 2	NO
U2_Ware_Toilet 4	NO
U2_Ware_Circulation 4	NO
U2_Storage 1	NO
U2_Storage 2	NO
U2_Ware_Circulation 5	NO
U2_Ware_Circulation 6	NO
U2_Ware_Circulation 7	NO
U2_Ware_Circulation 8	NO
U2_Ware_Circulation 9	NO
U2_Storage 3	NO
U2_Shower 3	NO
U2_Ware_Toilet 5	NO
U2_Ware_Toilet 6	NO
U2_Ware_Toilet 7	NO
U2_Ware_Toilet 8	NO
U2_Ware_Toilet 9	NO
U2_Ware_Office 4	NO

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
U2_Ware_WareStore 1		100	-	-	19417
U2_Ware_WareStore 2		100	-	-	530
U2_Ware_Circulation 1		-	80	-	95
U2_Ware_Circulation 2		-	80	-	51
U2_Ware_Toilet 1		-	80	-	54
U2_Ware_Toilet 2		-	80	-	34
U2_Ware_Toilet 3		-	80	-	49
U2_Ware_Circulation 3		-	80	-	40
U2_Ware_Office 1		90	-	-	803
U2_Ware_Office 2		90	-	-	802
U2_Ware_Office 3		90	-	-	315
U2_Ware_Reception 1		-	80	22	29
U2_Shower 1		-	80	-	12
U2_Shower 2		-	80	-	12
U2_Ware_Toilet 4		-	80	-	34
U2_Ware_Circulation 4		-	80	-	51
U2_Storage 1		80	-	-	4
U2_Storage 2		80	-	-	4
U2_Ware_Circulation 5		-	80	-	35
U2_Ware_Circulation 6		-	80	-	40
U2_Ware_Circulation 7		-	80	-	51
U2_Ware_Circulation 8		-	80	-	34

General lighting and display lighting		Luminous efficacy [lm/W]		
Zone name		Luminaire	Lamp	Display lamp
	Standard value	60	60	22
U2_Ware_Circulation 9		-	80	-
U2_Storage 3		80	-	-
U2_Shower 3		-	80	-
U2_Ware_Toilet 5		-	80	-
U2_Ware_Toilet 6		-	80	-
U2_Ware_Toilet 7		-	80	-
U2_Ware_Toilet 8		-	80	-
U2_Ware_Toilet 9		-	80	-
U2_Ware_Office 4		90	-	-
				General lighting [W]
				39
				4
				11
				55
				50
				34
				53
				47
				314

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
U2_Ware_WareStore 1	YES (+12%)	NO
U2_Ware_WareStore 2	NO (-52%)	NO
U2_Ware_Circulation 1	NO (-90%)	NO
U2_Ware_Office 1	NO (-85%)	NO
U2_Ware_Office 2	NO (-84%)	NO
U2_Ware_Office 3	NO (-91%)	NO
U2_Ware_Reception 1	NO (-88%)	NO
U2_Ware_Office 4	NO (-91%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	5012	5012
External area [m ²]	11977	11977
Weather	SOU	SOU
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	3557	4122
Average U-value [W/m ² K]	0.3	0.34
Alpha value* [%]	2.08	2.08

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

Building Use

% Area Building Type

	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
100	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	17.72	40.44
Cooling	0.65	0.73
Auxiliary	1.75	1.39
Lighting	9.52	18.92
Hot water	10.53	11.5
Equipment*	30.11	30.11
TOTAL **	40.18	72.98

* 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	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	64.3	141.48
Primary energy* [kWh/m ²]	91.29	124.87
Total emissions [kg/m ²]	15.6	23.1

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

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] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	82.9	0	23	0	25	1	0	1	0	
Notional	120	0	40.7	0	30	0.82	0	----	----	
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	24.6	0	6.8	0	0	1	0	1	0	
Notional	51.1	0	17.4	0	0	0.82	0	----	----	
[ST] Multiburner radiant heaters, [HS] Radiant heater, [HFT] Natural Gas, [CFT] Electricity										
Actual	60.7	0	18.5	0	0	0.91	0	0.91	0	
Notional	141.7	0	45.8	0	0	0.86	0	----	----	
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
Actual	20.7	94.6	7	9.7	22	0.82	2.7	0.91	3	
Notional	31	146.9	10.5	11.3	15.8	0.82	3.6	----	----	
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
Actual	14.5	43.7	4.9	4.5	12	0.82	2.7	0.91	3	
Notional	35.3	74.6	12	5.8	16.5	0.82	3.6	----	----	

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.26	External Wall
Floor	0.2	0.22	Ground Floor
Roof	0.15	0.18	Roof
Windows, roof windows, and rooflights	1.5	1.3	Rooflight
Personnel doors	1.5	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	Vehicle Door
High usage entrance doors	1.5	-	No high usage entrance doors in project
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Project name

Shell and Core

Harts Farm Rd Unit 2 - Green PV50

As designed

Date: Tue Feb 09 17:19:17 2021

Administrative information

Building Details

Address: Unit 2, Harts Farm Way, HAVANT,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.1"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.1

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Jeremy Holgate

Telephone number: 01932 781641

Address: Watkins Payne Partnership, Sunbury-on-Thames,
TW16 7AHCriterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	22.7
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	22.7
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	14
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	External Wall
Floor	0.25	0.22	0.22	Ground Floor
Roof	0.25	0.18	0.18	Roof (Office)
Windows***, roof windows, and rooflights	2.2	1.32	1.4	Spandrel Escape
Personnel doors	2.2	2.2	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	1.5	Vehicle Door
High usage entrance doors	3.5	-	-	No high usage entrance doors in project
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)]				
* There might be more than one surface where the maximum U-value occurs. ** 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. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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- Electric & Extract (12 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO

2- Electric NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO

3- VRF MVHR (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	-	0.7
Standard value	2.5*	2.6	N/A	N/A	0.5
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					

4- VRF NV (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	-	-
Standard value	2.5*	2.6	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. For types <=12 kW output, refer to EN 14825 for limiting standards.					

5- Radiant NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
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					NO

1- DHW Instant

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

2- HWS POU

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.01
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

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	1.9	1.6	0.5	1.1	0.5	1		Zone	Standard
U2_Ware_Toilet 1	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 2	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 3	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Office 1	-	-	-	1.9	-	-	-	-	-	-	-	N/A
U2_Ware_Office 2	-	-	-	1.9	-	-	-	-	-	-	-	N/A
U2_Ware_Office 3	-	-	-	1.9	-	-	-	-	-	-	-	N/A
U2_Shower 1	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Shower 2	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 4	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Shower 3	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 5	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 6	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 7	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 8	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Toilet 9	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U2_Ware_Office 4	-	-	-	1.9	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
U2_Ware_WareStore 1	YES
U2_Ware_WareStore 2	YES
U2_Ware_Circulation 1	NO
U2_Ware_Circulation 2	NO
U2_Ware_Toilet 1	NO
U2_Ware_Toilet 2	NO
U2_Ware_Toilet 3	NO
U2_Ware_Circulation 3	NO
U2_Ware_Office 1	NO
U2_Ware_Office 2	NO
U2_Ware_Office 3	NO
U2_Ware_Reception 1	NO
U2_Shower 1	NO
U2_Shower 2	NO

Shell and core configuration

Zone	Assumed shell?
U2_Ware_Toilet 4	NO
U2_Ware_Circulation 4	NO
U2_Storage 1	NO
U2_Storage 2	NO
U2_Ware_Circulation 5	NO
U2_Ware_Circulation 6	NO
U2_Ware_Circulation 7	NO
U2_Ware_Circulation 8	NO
U2_Ware_Circulation 9	NO
U2_Storage 3	NO
U2_Shower 3	NO
U2_Ware_Toilet 5	NO
U2_Ware_Toilet 6	NO
U2_Ware_Toilet 7	NO
U2_Ware_Toilet 8	NO
U2_Ware_Toilet 9	NO
U2_Ware_Office 4	NO

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
U2_Ware_WareStore 1		100	-	-	19417
U2_Ware_WareStore 2		100	-	-	530
U2_Ware_Circulation 1		-	80	-	95
U2_Ware_Circulation 2		-	80	-	51
U2_Ware_Toilet 1		-	80	-	54
U2_Ware_Toilet 2		-	80	-	34
U2_Ware_Toilet 3		-	80	-	49
U2_Ware_Circulation 3		-	80	-	40
U2_Ware_Office 1		90	-	-	803
U2_Ware_Office 2		90	-	-	802
U2_Ware_Office 3		90	-	-	315
U2_Ware_Reception 1		-	80	22	29
U2_Shower 1		-	80	-	12
U2_Shower 2		-	80	-	12
U2_Ware_Toilet 4		-	80	-	34
U2_Ware_Circulation 4		-	80	-	51
U2_Storage 1		80	-	-	4
U2_Storage 2		80	-	-	4
U2_Ware_Circulation 5		-	80	-	35
U2_Ware_Circulation 6		-	80	-	40
U2_Ware_Circulation 7		-	80	-	51
U2_Ware_Circulation 8		-	80	-	34
U2_Ware_Circulation 9		-	80	-	39
U2_Storage 3		80	-	-	4

General lighting and display lighting		Luminous efficacy [lm/W]			
Zone name		Luminaire	Lamp	Display lamp	General lighting [W]
	Standard value	60	60	22	
U2_Shower 3		-	80	-	11
U2_Ware_Toilet 5		-	80	-	55
U2_Ware_Toilet 6		-	80	-	50
U2_Ware_Toilet 7		-	80	-	34
U2_Ware_Toilet 8		-	80	-	53
U2_Ware_Toilet 9		-	80	-	47
U2_Ware_Office 4		90	-	-	314

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
U2_Ware_WareStore 1	YES (+12%)	NO
U2_Ware_WareStore 2	NO (-52%)	NO
U2_Ware_Circulation 1	NO (-90%)	NO
U2_Ware_Office 1	NO (-85%)	NO
U2_Ware_Office 2	NO (-84%)	NO
U2_Ware_Office 3	NO (-91%)	NO
U2_Ware_Reception 1	NO (-88%)	NO
U2_Ware_Office 4	NO (-91%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	5012	5012
External area [m ²]	11977	11977
Weather	SOU	SOU
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	3557	4122
Average U-value [W/m ² K]	0.3	0.34
Alpha value* [%]	2.08	2.08

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

Building Use

% Area Building Type

	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
100	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	17.08	39.99
Cooling	0.35	0.73
Auxiliary	0.75	0.52
Lighting	9.52	18.92
Hot water	10.53	11.5
Equipment*	30.11	30.11
TOTAL **	38.24	71.66

* 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	1.67	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	63.65	141.91
Primary energy* [kWh/m ²]	86.72	122.27
Total emissions [kg/m ²]	14	22.7

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

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] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	82.9	0	23	0	25	1	0	1	0	
Notional	120	0	40.7	0	30	0.82	0	----	----	
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	24.6	0	6.8	0	0	1	0	1	0	
Notional	51.1	0	17.4	0	0	0.82	0	----	----	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	20.7	94.6	1.4	5.3	7.9	4	5	4	5	
Notional	31	146.9	3.6	11.3	3.9	2.43	3.6	----	----	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	27.4	41.9	1.9	2.3	0	4	5	4	5	
Notional	35.4	73.4	4.1	5.7	0	2.43	3.6	----	----	
[ST] Multiburner radiant heaters, [HS] Radiant heater, [HFT] Natural Gas, [CFT] Electricity										
Actual	60.7	0	18.5	0	0	0.91	0	0.91	0	
Notional	141.7	0	45.8	0	0	0.86	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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.26	External Wall
Floor	0.2	0.22	Ground Floor
Roof	0.15	0.18	Roof
Windows, roof windows, and rooflights	1.5	1.3	Rooflight
Personnel doors	1.5	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	Vehicle Door
High usage entrance doors	1.5	-	No high usage entrance doors in project
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Project name

Shell and Core

Harts Farm Rd Unit 3 - Lean

As designed

Date: Tue Feb 09 16:31:56 2021

Administrative information

Building Details

Address: Unit 3, Harts Farm Way, HAVANT,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.1"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.1

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Jeremy Holgate

Telephone number: 01932 781641

Address: Watkins Payne Partnership, Sunbury-on-Thames,
TW16 7AHCriterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	25.7
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	25.7
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	21.4
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	External Wall
Floor	0.25	0.22	0.22	Ground Floor
Roof	0.25	0.18	0.18	Roof
Windows***, roof windows, and rooflights	2.2	1.34	1.4	Spandrel Escape
Personnel doors	2.2	2.2	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	1.5	Vehicle Door
High usage entrance doors	3.5	-	-	No high usage entrance doors in project
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)] * There might be more than one surface where the maximum U-value occurs. ** 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. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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- Electric & Extract (15 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO

2- Electric NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO

3- Radiant NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
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					NO

4- FCU MVHR (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3	-	-	0.7
Standard value	0.91*	2.55	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

5- FCU NV (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3	-	-	-
Standard value	0.91*	2.55	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 gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

1- DHW Instant

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

2- HWS POU

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.01
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

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	1.9	1.6	0.5	1.1	0.5	1		Zone	Standard
U3_Ware_Circulation 1	-	-	-	-	-	-	-	0.5	-	-	-	N/A
U3_Ware_Toilet 1	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Ware_Toilet 2	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Ware_Toilet 3	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Ware_Office 1	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U3_Ware_Office 2	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U3_Ware_Office 3	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U3_Ware_Reception 1	-	-	-	-	-	-	-	0.5	-	-	-	N/A
U3_Shower 1	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Shower 2	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Ware_Toilet 4	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Ware_Office 4	-	-	-	1.9	-	-	-	0.5	-	-	-	N/A
U3_Shower 3	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Shower 4	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Shower 5	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Shower 6	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Ware_Toilet 5	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Ware_Toilet 6	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Ware_Toilet 7	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Ware_Toilet 8	-	-	0.5	-	-	-	-	-	-	-	-	N/A
U3_Ware_Toilet 9	-	-	0.5	-	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
U3_Ware_WareStore 1	YES
U3_Ware_WareStore 2	YES
U3_Ware_Circulation 1	NO
U3_Ware_Circulation 2	NO
U3_Ware_Toilet 1	NO
U3_Ware_Toilet 2	NO
U3_Ware_Toilet 3	NO
U3_Ware_Office 1	NO
U3_Ware_Office 2	NO

Shell and core configuration

Zone	Assumed shell?
U3_Ware_Office 3	NO
U3_Ware_Reception 1	NO
U3_Shower 1	NO
U3_Shower 2	NO
U3_Ware_Circulation 3	NO
U3_Ware_Toilet 4	NO
U3_Storage 1	NO
U3_Storage 2	NO
U3_Ware_Office 4	NO
U3_Ware_Circulation 4	NO
U3_Ware_Circulation 5	NO
U3_Ware_Circulation 6	NO
U3_Ware_Circulation 7	NO
U3_Ware_Circulation 8	NO
U3_Ware_Circulation 9	NO
U3_Ware_Circulation 10	NO
U3_Ware_Circulation 11	NO
U3_Ware_Circulation 12	NO
U3_Shower 3	NO
U3_Shower 4	NO
U3_Shower 5	NO
U3_Shower 6	NO
U3_Storage 3	NO
U3_Ware_Toilet 5	NO
U3_Ware_Toilet 6	NO
U3_Ware_Toilet 7	NO
U3_Ware_Toilet 8	NO
U3_Ware_Toilet 9	NO

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
U3_Ware_WareStore 1	100	-	-	18548
U3_Ware_WareStore 2	100	-	-	1980
U3_Ware_Circulation 1	-	80	-	92
U3_Ware_Circulation 2	-	80	-	54
U3_Ware_Toilet 1	-	80	-	76
U3_Ware_Toilet 2	-	80	-	36
U3_Ware_Toilet 3	-	80	-	96
U3_Ware_Office 1	90	-	-	1530
U3_Ware_Office 2	90	-	-	1434
U3_Ware_Office 3	90	-	-	1528
U3_Ware_Reception 1	-	80	22	23
U3_Shower 1	-	80	-	8
U3_Shower 2	-	80	-	19

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
U3_Ware_Circulation 3		-	80	-	64
U3_Ware_Toilet 4		-	80	-	77
U3_Storage 1		80	-	-	9
U3_Storage 2		80	-	-	9
U3_Ware_Office 4		90	-	-	1432
U3_Ware_Circulation 4		-	80	-	59
U3_Ware_Circulation 5		-	80	-	54
U3_Ware_Circulation 6		-	80	-	66
U3_Ware_Circulation 7		-	80	-	65
U3_Ware_Circulation 8		-	80	-	60
U3_Ware_Circulation 9		-	80	-	53
U3_Ware_Circulation 10		-	80	-	66
U3_Ware_Circulation 11		-	80	-	63
U3_Ware_Circulation 12		-	80	-	59
U3_Shower 3		-	80	-	8
U3_Shower 4		-	80	-	19
U3_Shower 5		-	80	-	8
U3_Shower 6		-	80	-	19
U3_Storage 3		80	-	-	9
U3_Ware_Toilet 5		-	80	-	36
U3_Ware_Toilet 6		-	80	-	97
U3_Ware_Toilet 7		-	80	-	75
U3_Ware_Toilet 8		-	80	-	35
U3_Ware_Toilet 9		-	80	-	95

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
U3_Ware_WareStore 1	YES (+12%)	NO
U3_Ware_WareStore 2	NO (-48%)	NO
U3_Ware_Circulation 1	NO (-56%)	NO
U3_Ware_Office 1	NO (-71%)	NO
U3_Ware_Office 2	NO (-88%)	NO
U3_Ware_Office 3	NO (-69%)	NO
U3_Ware_Reception 1	NO (-27%)	NO
U3_Ware_Office 4	NO (-87%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	5922	5922
External area [m ²]	12216	12216
Weather	SOU	SOU
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	3724	4173
Average U-value [W/m ² K]	0.3	0.34
Alpha value* [%]	2.35	2.35

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

Building Use

% Area Building Type

	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
100	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	14.3	31.25
Cooling	2.42	1.68
Auxiliary	4.84	2.97
Lighting	10.37	20.79
Hot water	16.94	18.55
Equipment*	31.07	31.07
TOTAL **	48.87	75.25

* 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	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	70.45	124.38
Primary energy* [kWh/m ²]	125.6	134.48
Total emissions [kg/m ²]	21.4	25.7

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

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] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	78.8	0	21.9	0	25	1	0	1	0	
Notional	116.3	0	39.5	0	30	0.82	0	----	----	
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	56.4	0	15.7	0	0	1	0	1	0	
Notional	71.9	0	24.4	0	0	0.82	0	----	----	
[ST] Multiburner radiant heaters, [HS] Radiant heater, [HFT] Natural Gas, [CFT] Electricity										
Actual	51.9	0	15.9	0	0	0.91	0	0.91	0	
Notional	119.5	0	38.6	0	0	0.86	0	----	----	
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
Actual	9.7	146.4	3.3	15.1	27.3	0.82	2.7	0.91	3	
Notional	17	148.9	5.8	11.5	15.9	0.82	3.6	----	----	
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
Actual	52	167.4	17.6	17.2	25.8	0.82	2.7	0.91	3	
Notional	52.7	55.9	17.9	4.3	15.8	0.82	3.6	----	----	

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.26	External Wall
Floor	0.2	0.22	Ground Floor
Roof	0.15	0.18	Roof
Windows, roof windows, and rooflights	1.5	1.3	Rooflight
Personnel doors	1.5	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	Vehicle Door
High usage entrance doors	1.5	-	No high usage entrance doors in project
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Project name

Shell and Core

Harts Farm Rd Unit 3 - Green

As designed

Date: Tue Feb 09 16:50:26 2021

Administrative information

Building Details

Address: Unit 3, Harts Farm Way, HAVANT,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.1"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.1

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Jeremy Holgate

Telephone number: 01932 781641

Address: Watkins Payne Partnership, Sunbury-on-Thames,
TW16 7AHCriterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	24.8
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	24.8
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	19.1
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	External Wall
Floor	0.25	0.22	0.22	Ground Floor
Roof	0.25	0.18	0.18	Roof
Windows***, roof windows, and rooflights	2.2	1.34	1.4	Spandrel Escape
Personnel doors	2.2	2.2	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	1.5	Vehicle Door
High usage entrance doors	3.5	-	-	No high usage entrance doors in project
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)]				
* There might be more than one surface where the maximum U-value occurs. ** 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. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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- Electric & Extract (15 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO

2- Electric NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
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					NO

3- Radiant NV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	-	-	-
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					NO

4- VRF MVHR (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	-	0.7
Standard value	2.5*	2.6	N/A	N/A	0.5
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. For types <=12 kW output, refer to EN 14825 for limiting standards.					

5- VRF NV (2 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	-	-	-
Standard value	2.5*	2.6	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. For types <=12 kW output, refer to EN 14825 for limiting standards.					

1- DHW Instant

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

2- HWS POU

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.01
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

Shell and core configuration

Zone	Assumed shell?
U3_Ware_WareStore 1	YES
U3_Ware_WareStore 2	YES
U3_Ware_Circulation 1	NO
U3_Ware_Circulation 2	NO
U3_Ware_Toilet 1	NO
U3_Ware_Toilet 2	NO
U3_Ware_Toilet 3	NO
U3_Ware_Office 1	NO
U3_Ware_Office 2	NO
U3_Ware_Office 3	NO
U3_Ware_Reception 1	NO
U3_Shower 1	NO
U3_Shower 2	NO
U3_Ware_Circulation 3	NO
U3_Ware_Toilet 4	NO
U3_Storage 1	NO
U3_Storage 2	NO
U3_Ware_Office 4	NO
U3_Ware_Circulation 4	NO
U3_Ware_Circulation 5	NO
U3_Ware_Circulation 6	NO
U3_Ware_Circulation 7	NO
U3_Ware_Circulation 8	NO
U3_Ware_Circulation 9	NO
U3_Ware_Circulation 10	NO
U3_Ware_Circulation 11	NO
U3_Ware_Circulation 12	NO
U3_Shower 3	NO
U3_Shower 4	NO
U3_Shower 5	NO
U3_Shower 6	NO
U3_Storage 3	NO
U3_Ware_Toilet 5	NO
U3_Ware_Toilet 6	NO
U3_Ware_Toilet 7	NO
U3_Ware_Toilet 8	NO
U3_Ware_Toilet 9	NO

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
U3_Ware_WareStore 1	100	-	-	18548
U3_Ware_WareStore 2	100	-	-	1980

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
U3_Ware_Circulation 1		-	80	-	92
U3_Ware_Circulation 2		-	80	-	54
U3_Ware_Toilet 1		-	80	-	76
U3_Ware_Toilet 2		-	80	-	36
U3_Ware_Toilet 3		-	80	-	96
U3_Ware_Office 1		90	-	-	1530
U3_Ware_Office 2		90	-	-	1434
U3_Ware_Office 3		90	-	-	1528
U3_Ware_Reception 1		-	80	22	23
U3_Shower 1		-	80	-	8
U3_Shower 2		-	80	-	19
U3_Ware_Circulation 3		-	80	-	64
U3_Ware_Toilet 4		-	80	-	77
U3_Storage 1		80	-	-	9
U3_Storage 2		80	-	-	9
U3_Ware_Office 4		90	-	-	1432
U3_Ware_Circulation 4		-	80	-	59
U3_Ware_Circulation 5		-	80	-	54
U3_Ware_Circulation 6		-	80	-	66
U3_Ware_Circulation 7		-	80	-	65
U3_Ware_Circulation 8		-	80	-	60
U3_Ware_Circulation 9		-	80	-	53
U3_Ware_Circulation 10		-	80	-	66
U3_Ware_Circulation 11		-	80	-	63
U3_Ware_Circulation 12		-	80	-	59
U3_Shower 3		-	80	-	8
U3_Shower 4		-	80	-	19
U3_Shower 5		-	80	-	8
U3_Shower 6		-	80	-	19
U3_Storage 3		80	-	-	9
U3_Ware_Toilet 5		-	80	-	36
U3_Ware_Toilet 6		-	80	-	97
U3_Ware_Toilet 7		-	80	-	75
U3_Ware_Toilet 8		-	80	-	35
U3_Ware_Toilet 9		-	80	-	95

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
U3_Ware_WareStore 1	YES (+12%)	NO
U3_Ware_WareStore 2	NO (-48%)	NO
U3_Ware_Circulation 1	NO (-56%)	NO
U3_Ware_Office 1	NO (-71%)	NO
U3_Ware_Office 2	NO (-88%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
U3_Ware_Office 3	NO (-69%)	NO
U3_Ware_Reception 1	NO (-27%)	NO
U3_Ware_Office 4	NO (-87%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	5922	5922
External area [m ²]	12216	12216
Weather	SOU	SOU
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	3724	4173
Average U-value [W/m ² K]	0.3	0.34
Alpha value* [%]	2.35	2.35

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

Building Use

% Area Building Type

	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
100	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	13.6	30.64
Cooling	1.31	1.68
Auxiliary	1.69	1.12
Lighting	10.37	20.79
Hot water	16.94	18.55
Equipment*	31.07	31.07
TOTAL **	43.9	72.79

* 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	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	70.27	124.78
Primary energy* [kWh/m ²]	111.95	128.86
Total emissions [kg/m ²]	19.1	24.8

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

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] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	78.8	0	21.9	0	25	1	0	1	0	
Notional	116.3	0	39.5	0	30	0.82	0	----	----	
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
Actual	56.4	0	15.7	0	0	1	0	1	0	
Notional	71.9	0	24.4	0	0	0.82	0	----	----	
[ST] Multiburner radiant heaters, [HS] Radiant heater, [HFT] Natural Gas, [CFT] Electricity										
Actual	51.9	0	15.9	0	0	0.91	0	0.91	0	
Notional	119.5	0	38.6	0	0	0.86	0	----	----	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	9.7	146.4	0.7	8.1	7.9	4	5	4	5	
Notional	17	148.9	2	11.5	3.9	2.43	3.6	----	----	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
Actual	106.3	164.6	7.4	9.1	0	4	5	4	5	
Notional	53.2	55.9	6.1	4.3	0	2.43	3.6	----	----	

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

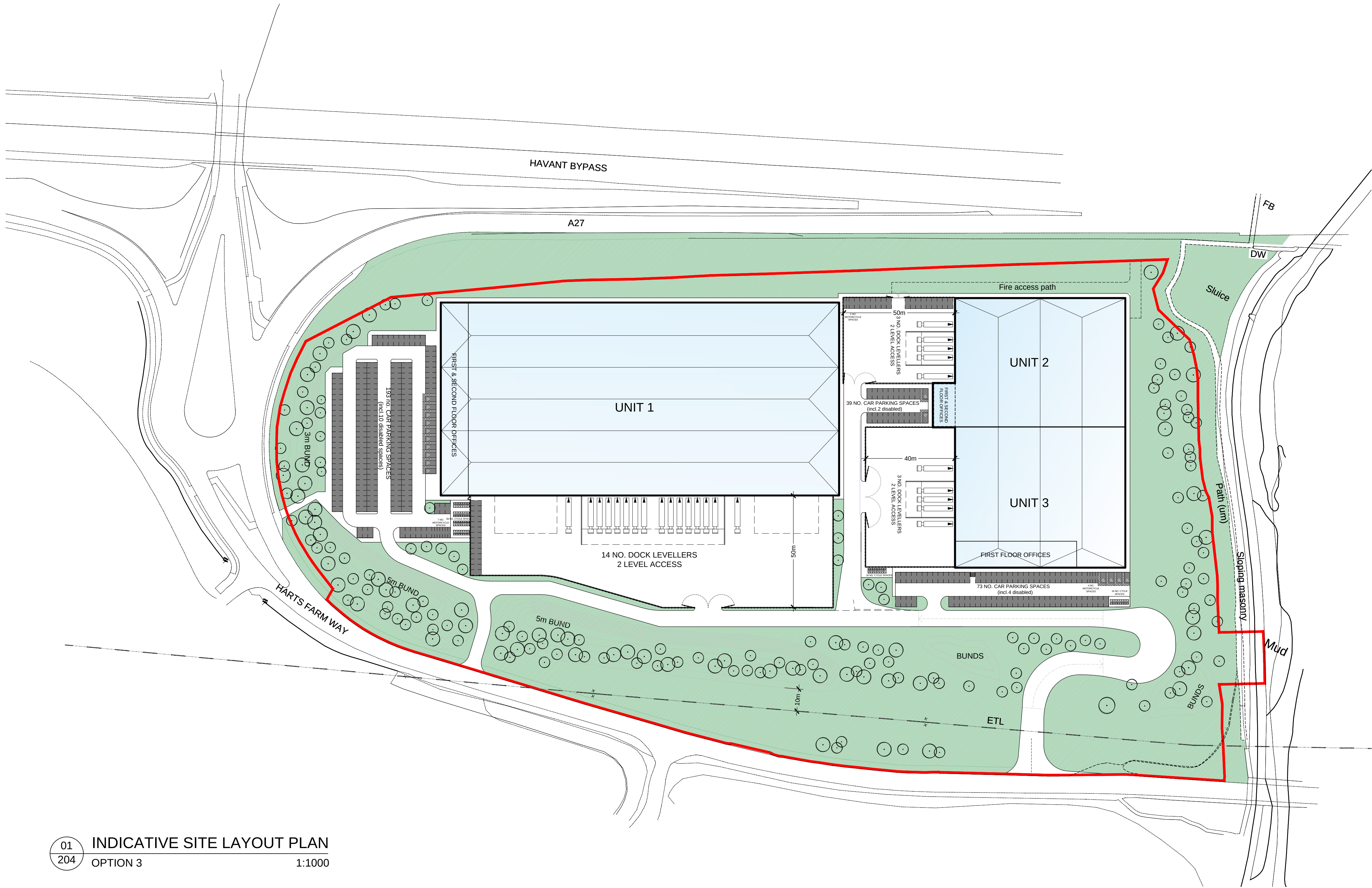
Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

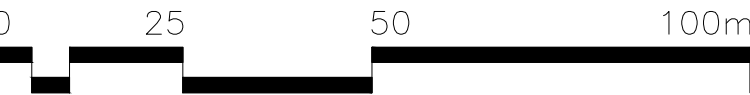
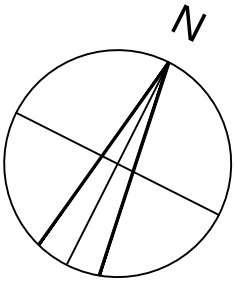
Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.26	External Wall
Floor	0.2	0.22	Ground Floor
Roof	0.15	0.18	Roof
Windows, roof windows, and rooflights	1.5	1.3	Rooflight
Personnel doors	1.5	2.2	Pedestrian Door
Vehicle access & similar large doors	1.5	1.5	Vehicle Door
High usage entrance doors	1.5	-	No high usage entrance doors in project
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3



NOTES:

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NOTE:

TREE PLANTING AND BUNDS ARE INDICATIVE.
PLEASE REFER TO LANDSCAPE ARCHITECT'S
DRAWINGS FOR DETAILS OF SOFT LANDSCAPING

-	09/02/2021	First Issue	AH	AC
REV	DATE	NOTE	DRAW	CHK



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TITLE
HARTS FARM WAY, HAVANT
DRAWING
INDICATIVE SITE LAYOUT PLAN
OPTION 3
CLIENT
CLOWES DEVELOPMENTS (UK) LTD.

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FEBRUARY 2021	1:1000 @ A1	AH
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	PLANNING	AC

DRAWING NUMBER
31383 / PL / 204

01 INDICATIVE SITE LAYOUT PLAN
204 OPTION 3 1:1000