Harefield Academy, London Borough of Hillingdon

Energy Strategy

16th August 2022

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JAW Sustainability

Contents

1 Introduction

This energy strategy has been prepared for the proposed refurbishment and extension of Harefield Academy, in order to meet the sustainability requirements of the London Plan and the London Borough of Hillingdon.

The site is located in the London Borough of Hillingdon, Northwood Way, Harefield, UB9 6ET. The project consists of the refurbishment and extension of an existing school in Harefield, which will become an SEN school. The site location is shown a in Figure 1-01.

Figure 1-01 – Site Location

2 Policy

2.1 Hillingdon Local Plan: Part 1 - Strategic Policies

Policy EM1: Climate Change Adaptation and Mitigation

The Council will ensure that climate change mitigation is addressed at every stage of the development process by:

1. Prioritising higher density development in urban and town centres that are well served by sustainable forms of transport.
2. Promoting a modal shift away from private car use and requiring new development to include innovative initiatives to reduce car dependency.
3. Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market.
4. Working with developers of major schemes to identify the opportunities to help provide efficiency initiatives that can benefit the existing building stock.
5. Promoting the use of decentralised energy within large scale development whilst improving local air quality levels.
6. Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions.
7. Encouraging sustainable techniques to land remediation to reduce the need to transport waste to landfill. In particular developers should consider bioremediation(39) as part of their proposals.
8. Encouraging the installation of renewable energy for all new development in meeting the carbon reduction targets savings set out in the London Plan. Identify opportunities for new sources of electricity generation including anaerobic digestion, hydroelectricty and a greater use of waste as a resource.
9. Promoting new development to contribute to the upgrading of existing housing stock where appropriate.

The Borough will ensure that climate change adaptation is addressed at every stage of the development process by:

10. Locating and designing development to minimise the probability and impacts of flooding.
11. Requiring major development proposals to consider the whole water cycle impact which includes flood risk management, foul and surface water drainage and water consumption.
12. Giving preference to development of previously developed land to avoid the loss of further green areas.
13. Promoting the use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase the amount of carbon sinks.
14. Promoting the inclusion of passive design measures to reduce the impacts of urban heat effects.

2.2 The London Plan

Policy SI 2 Minimising greenhouse gas emissions

A. Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

    1. be lean: use less energy and manage demand during operation
    2. be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
    3. be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
    4. be seen: monitor, verify and report on energy performance.

B. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C. A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:
    a. through a cash in lieu contribution to the borough's carbon offset fund, or
    b. off-site provided that an alternative proposal is identified, and delivery is certain.

D. Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

E. Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

3 Energy Strategy

An energy strategy has been developed following the energy hierarchy 'Be Lean, Be Clean, Be Green, Be Seen'. Energy calculations using Building Regulations approved and accredited software have been undertaken at each stage to calculate the savings associated with the measures incorporated.

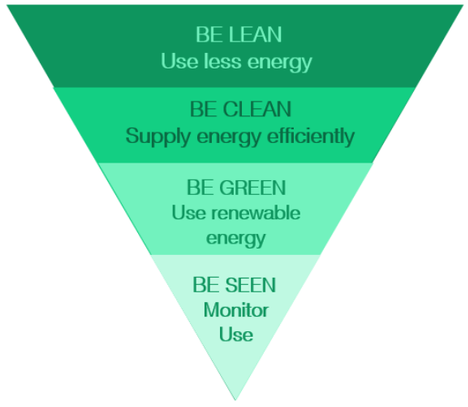


Figure 3-01 The Energy Hierarchy

Energy calculations have been carried out using IES VE Compliance tool, based on Part L 2013 building regulations, to produce separate BRUKLs for the refurbishment and extension section of the development. The refurbishment has been compared to a baseline scenario that uses the fabric and services performance outlined values in the Greater London Authorities Energy Planning Guidance document. The extension has been treated as a new building, compared to the notional building.

The BRUKLs are used to assess the impact on energy demand and CO_2 emissions of improvements through the hierarchy and demonstrate the most appropriate solution for the development to meet the relevant planning requirements.

3.1 2021 Part L Update

Revised Part L building regulations came into effect in June 2022. However, as the accompanying Part L 2021 software is not yet available, planning applicants are recommended to continue to use the 2020 guidance, spreadsheet and the Part L 2013 methodology until the software has been approved by government and is fully functional.

The proposed development has been checked for compliance with Part L 2021 of the building regulations, shown in the appendix.

3.2 Energy Targets

For the refurbishment, there is no specific targets, however it is required to demonstrating how the energy hierarchy has been implemented and calculated reduction in emissions over a notional baseline.

Table 3-01 and 3-02 details the energy and carbon breakdown of the baseline emissions for the refurbishment and extension. The baseline emissions for the refurbishment have been calculated

using the fabric and services values outlined in the GLAs Energy assessment guidance document, as required by the GLA. For the extension, the baseline is based on the 2013 building regulations notional building.

	Gas (kWh/yr)			Gas CO2 (kg/yr)	Electricity (kWh/yr)						Electricity CO2 (kg/yr)
	Space Heating	Hot Water	Total		Space Heating	HW	Cooling	Pumps & Fans	Lighting	Total	
Refurbishment	42,674	9,746	52,420	11,008	0	0	0	6,659	29,823	36,482	8,500
Extension	10,497	6,164	16,662	3,499	0	0	0	2,173	5,352	7,337	1,709
Total	**53,171**	**15,910**	**69,082**	**14,507**	**0**	**0**	**0**	**8,832**	**35,175**	**43,819**	**10,209**

Table 3-01 Baseline regulated energy demand and carbon emissions per energy source

	Total Energy (kWh/yr)	Total CO2 (kg/yr)
Refurbishment	88,902	19,509
Extension	23,998	5,208
Total	**112,900**	**24,717**

Table 3-02 – Total Baseline energy demand and carbon emissions

3.3 Be Lean

As part of the Be Lean approach, passive design measures have been considered throughout the pre-planning stage to reduce initial energy demand.

Solar Gain Control and Daylight

Solar gains are a passive form of heating from the sun's radiation and are beneficial to a building during winter months as they provide an effective source of heat and reduce internal heating requirements. However, during summer months they must be controlled in order to mitigate the risk of overheating. They can be controlled through glazing and shading design in order to allow low level winter sun to enter the building and to limit access to high level summer sun. Glazing will incorporate low emissivity coatings to limit overheating without compromising light transmittance.

Building Fabric

Designing an efficient thermal envelope will greatly reduce the need for space heating and cooling as heat transmittance through the thermal elements is reduced.

Low air permeability rates will also reduce heating and cooling energy demand by reducing the volume of air that can penetrate the building.

As part of a 'fabric first' approach, the building fabric has been carefully considered and specified to meet or exceed current Building Regulations minimum requirements, as detailed in Table 3-03 below.

Where required, refurbished fabric elements will be upgraded to meet the minimum requirements in Approved Document Part L. New thermal elements will need to meet the minimum required for new thermal elements in Approved Document Part L.

Fabric Component	Refurbishment U Value	Extension U Value
Existing External Walls	0.3 W/m^{2}K	-
Existing Roof	0.18W/m^{2}K	-
Existing Ground/Exposed Floor	0.25 W/m^{2}K	-
Existing Windows (including glazed doors)	2.2 W/m^{2}K, G-value 0.4	-
New External Walls	-	0.14 W/m^{2}K
New Windows (Including Glazed doors)	1.4 W/m^{2}K, G-value 0.4	1 W/m^{2}K, G-value 0.4
New Roof	-	0.11 W/m^{2}K
New Ground/Exposed Floor	-	0.1 W/m^{2}K
Air Tightness	10 m^3/m^2/h	3 m^3/m^2/h

Table 3-03 Proposed Be Lean passive design measures

Building Services

Initial systems have been identified to maximise efficiency therefore reducing energy used to deliver services. Table 3-04 shows the proposed services strategy and energy efficiency measures for the development. These are provisional system proposals and may change as the design evolves.

In line with the GLA guidance, a gas boiler has been assumed to provide heating and hot water for the be lean stage, this does not represent the proposed strategy of the development.

Services Component	Proposed Specification
Space Heating	*Assumed gas boiler for Be Lean Stage, 91% efficient*
Domestic Hot Water	*Assumed gas boiler for Be Lean Stage, 91% efficient*
Ventilation	Natural ventilated in all spaces except MVHR : Hygiene and small hygiene room, medical and office NVHR : Classrooms and teaching areas
Lighting	LED lighting 145 lm/W in changing rooms, circulation, lobby, stairs, WC and food technology classroom 120 lm/W in store, group room, IT comms, kitchen, quiet dining, breakout room, speech & language, Snoezelen room, conference room 95 lm/W in classrooms, fitness room, offices, hygiene room, independent living, medical, parent room, plant room, reception, team leader, curriculum lead, staff workroom, cleaner store, physio and library
Lighting Controls	Occupancy sensing in changing rooms, circulation, store, hygiene room, IT comms, lift, lobby, reception, stairs, WC, breakout room, hygiene rooms, speech & language RIDI class control classrooms, fitness room, quiet dining, meeting room, Snoezelen room, occu therapy, physio, library and conference room Photoelectric sensors in medical

Table 3-04 Proposed energy efficient design measures

Energy Use

The breakdown of carbon and energy use has been identified for the site. Table 3-05 and 3-06 shows the breakdown of carbon and energy use once the strategies proposed at the be lean stage are incorporated.

	Gas (kWh/yr)			Gas CO2 (kg/yr)	Electricity (kWh/yr)						Electricity CO2 (kg/yr)
	Space Heating	Hot Water	Total		Space Heating	HW	Cooling	Pumps & Fans	Lighting	Total	
Refurbishment	61,015	9,746	70,761	14,860	0	0	0	4,206	11,365	15,571	3,628
Extension	6,093	6,164	12,258	2,574	0	0	0	1,612	2,689	4,301	1,002
Total	**67,108**	**15,910**	**83,019**	**17,434**	**0**	**0**	**0**	**5,818**	**14,054**	**19,872**	**4,630**

Table 3-05 Be Lean regulated energy demand and carbon emissions per energy source

	Total Energy (kWh/yr)	Total CO2 (kg/yr)
Refurbishment	86,332	18,488
Extension	16,558	3,576
Total	**102,890**	**22,064**

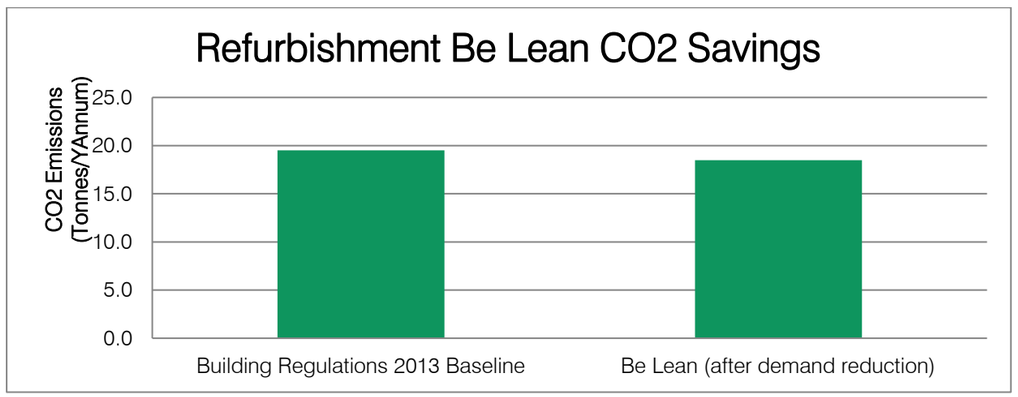
Table 3-06 – Total Be Lean energy demand and carbon emissions

Carbon Savings

Table 3-07 and Figure 3-02 demonstrates the percentage improvement over the notional baseline levels for the be lean stage. The refurbishment demonstrates a 5% reduction in CO2 emissions over the baseline at the Be Lean stage, and the extension demonstrates a 31% saving over the Part L 2013 notional baseline.

	Refurbishment			Extension		
	CO_2 Emissions (tonnes/annum)	CO_2 Savings (tonnes/annum)	% Saving	CO_2 Emissions (tonnes/annum)	CO_2 Savings (tonnes/annum)	% Saving
Baseline	19.5			5.2		
Be Lean	18.5	1.0	5%	3.6	1.6	31%

Table 3-07 Be Lean improvements over the baseline



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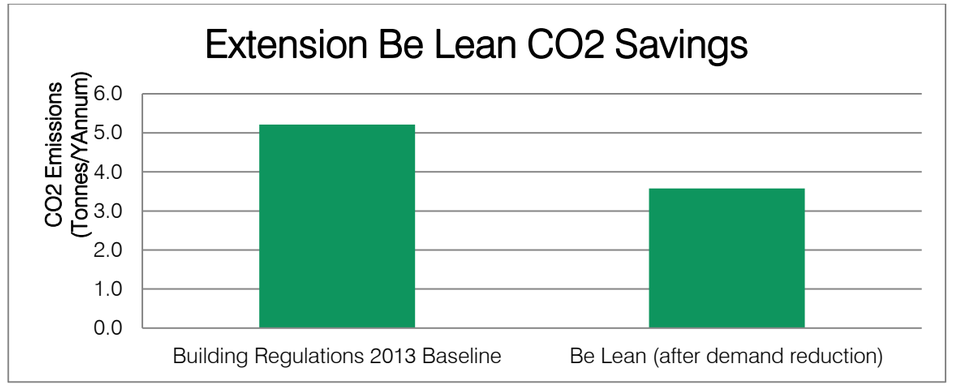


(b)

Figure 3-02 Be Lean improvement over the baseline (a) Refurbishment (b) extension

3.4 Be Clean

As part of the Be Clean approach, the use of energy efficient equipment, heat networks and community heating have been considered.

No existing or proposed heat networks are located within close proximity of the development, as shown in Figure 3-03.

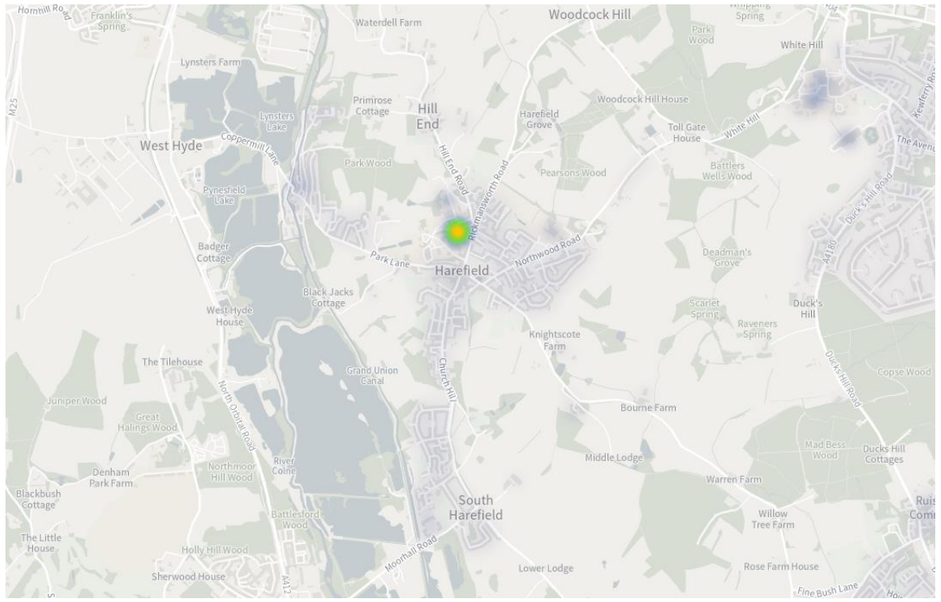
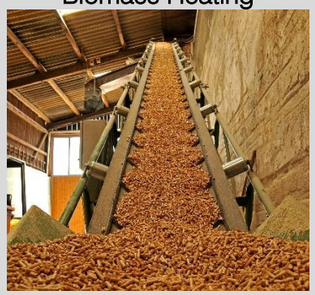


Figure 3-03 Harefield Acadamy Location, London Heat Map

3.5 Be Green

At the Be Green stage, renewable and low carbon technologies are investigated. Table 3-08 considers the feasibility of renewable energy technologies for the scheme.

LZC Technologies	Description	Noise	Visual impact	Internal Space	External Space	Capital Cost	Maintenance	Feasibility	
Solar Thermal Collectors 	Solar thermal collectors can be used to provide hot water using the irradiation from the sun. They can generally provide approx. 50% of the hot water demand	🟢	🟡	🟢	🟡	🔴	🟡	There are areas of flat roof that can incorporate solar technologies. However, carbon savings are quite low and it is quite a high cost technology. The development is proposing the use of heat pumps, which do combine well with Solar thermal technology	✖
Solar Photovoltaic Panels 	Solar PV panels generate electricity from the sun's energy. They should be installed within 90° of due south ideally at a 30° angle. The electricity can be used to supply the landlords load.	🟢	🟡	🟢	🟡	🟡	🟡	There are areas of flat roof that can incorporate solar technologies. Solar PV is ideal for making carbon savings while being a simple technology.	✓
Biomass Heating 	Solid, liquid or gaseous fuels derived from plant material can provide boiler heat for space and water heating A biomass boiler would supplement a standard gas heating system so some of the cost may be offset through money saved on using smaller traditional boilers reliability of fuel access/supply can be a problem	🟡	🟢	🔴	🟡	🔴	🔴	Biomass is not considered feasible for this development due to issues with fuel storage, access for delivery vehicles and local NO_x emissions	✖

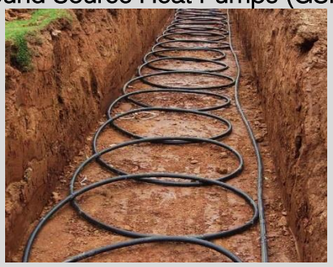
Wind Turbines 	Vertical and horizontal axis wind turbines enable electricity to be generated using the power within the wind Not suitable for urban environments due to low wind conditions and obstructions	🔴	🔴	🟢	🔴	🔴	🟡	This development is in an urban environment and so a wind turbine will not generate much energy	×
Ground Source Heat Pumps (GSHP) 	Utilising horizontal loops or vertical boreholes, GSHP make use of the grounds almost constant temperature to provide heating and/or cooling using a heat exchanger connected to a space/water heating delivery system Optimum efficiency with underfloor heating systems	🟡	🟢	🟡	🟡	🔴	🟡	GSHP are not a feasible technology for the site since there is a limited external space available for installation of boreholes	×
Air Source Heat Pumps (ASHP) 	Air Source Heat Pumps extract latent energy from the external air in a manner similar to ground source heat pumps. Optimum efficiency with underfloor heating systems	🟡	🟡	🟡	🟡	🟡	🟡	Air source heat pumps are proposed for providing heating to the development via underfloor heating	✓

Table 3-08 Feasibility of LZC technologies for the development

Renewable and low carbon systems

The feasibility study has identified ASHP and Solar PV as the most appropriate technologies for the development. The proposed systems for the development are outlined in Table 3-09. The total area of the PV panels have been divided into the two different parts of the development.

Services Component	Proposed Specification
Photovoltaic panels	17.82 kWp system Orientation – SW Angle of elevation – 40˚ Estimates panel number 54 (330Wp panels)
ASHP	Wet underfloor heating system SCOP 3.19

Table 3-09 Proposed Be Green systems

Energy Use

The breakdown of carbon and energy use has been identified for the site. Table 3-10 demonstrates the breakdown of carbon and energy use once the be green strategies proposed in this report are incorporated.

	Electricity (kWh/yr)							Electricity CO2 (kg/yr)	Total Energy (kWh/yr)	Total CO2 (kg/yr)
	Space Heating	Hot Water	Cooling	Pumps & Fans	Lighting	PV	Total			
Refurbishment	17,056	8,879	0	4,206	11,365	-7,326	34,179	7,964	34,179	7,964
Extension	1,741	5,610	0	1,612	2,689	-7,325	4,327	1,008	4,327	1,008
Total	**18,797**	**14,489**	**0**	**5,818**	**14,054**	**-14,651**	**38,506**	**8,972**	**38,506**	**8,972**

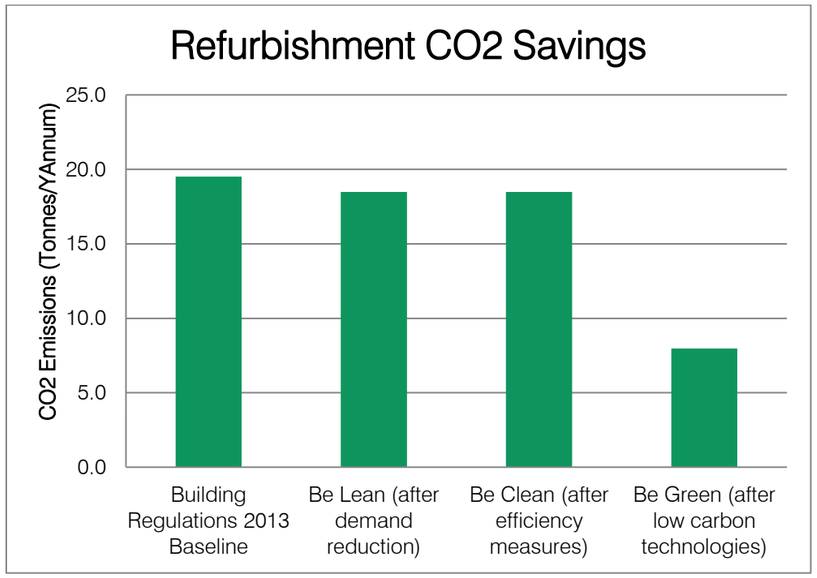
Table 3-10 Be Green regulated energy demand and carbon emissions per energy source

Carbon Savings

Table 3-11 and Figure 3-04 demonstrate the percentage improvement over the baseline for the refurbishment with Be Green measures incorporated. The refurbishment demonstrates a 59.2% reduction in CO2 emissions over the baseline at the Be Green stage. The extension demonstrates a 80.6% improvement over the 2013 Building regulations

	Refurbishment			Extension		
	CO_2 Emissions (tonnes/annum)	CO_2 Savings (tonnes/annum)	% Saving	CO_2 Emissions (tonnes/annum)	CO_2 Savings (tonnes/annum)	% Saving
Baseline	19.5			5.2		
Be Lean	18.5	1.0	5.2%	3.6	1.6	31.3%
Be Clean	18.5	0.0	0.0%	3.6	0.0	0.0%
Be Green	8.0	10.5	53.9%	1.0	2.6	49.3%
Total		11.5	59.2%		4.2	80.6%

Table 3-11 Be Green improvements over the baseline emissions



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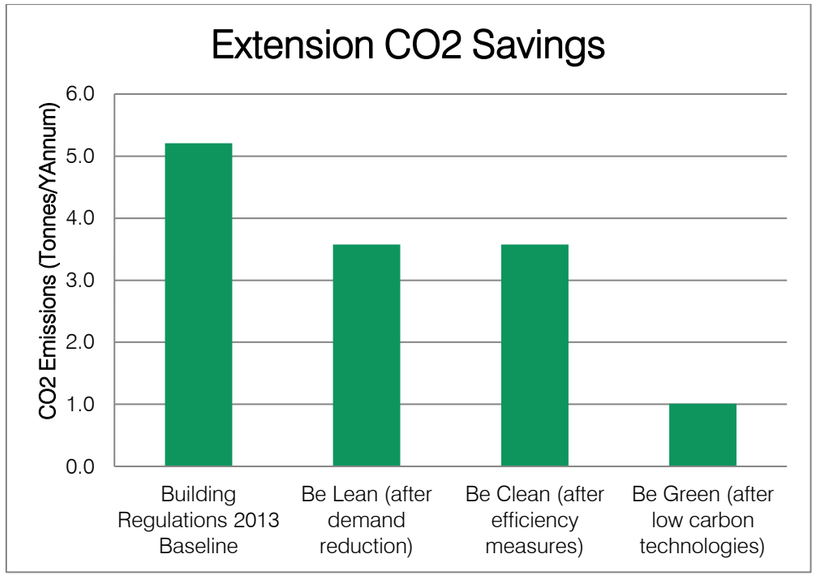


(b)

Figure 3-04 Be Green improvement over the baseline emissions (a) refurbishment (b) extension

3.6 Be Seen

All major plant should be fitted with meters to allow remote monitoring of energy used by the communal heating systems and electrical distribution boards. A contract will be put in place to

monitor the readings so that they can be compared with the predicted energy performance, and this information will be reported.

3.7 Carbon offset payment

The extension has a target of net zero carbon. The extension has achieved a 80.6% improvement over the notional baseline of the development respectively. In line with the London Plan carbon reduction requirements, there is a target of zero carbon, which can be achieved through an offset payment when there is a shortfall on site. This calculation is detailed below.

Shortfall on zero carbon		
Carbon emissions (tonnes / annum)	30 year carbon emissions	Offset payment (£95/tonne)
1.01	30	£ 2,896

4 Conclusion

This energy strategy has been prepared for the proposed refurbishment and extension of Harefield Academy, in order to meet the sustainability requirements of the London Plan and the London Borough of Hillingdon. The site is located in the London Borough of Hillingdon, Northwood Way, Harefield, UB9 6ET. The project consists of the refurbishment and extension of an existing school in Harefield, which will become an SEN school.

As required by the London Plan, the development follows the energy hierarchy, incorporating passive design measures, energy efficient equipment and renewable energy. Carbon emissions have been calculated over a baseline scenario. The baseline emissions for the refurbishment has been calculated using the Part L 2013 minimum fabric and services standards for residential buildings, with further assumptions taken from the GLAs Energy assessment guidance document. For the extension, the baseline is based on the 2013 building regulations notional building.

For the refurbishment, there is no specific targets, however it is required to demonstrating how the energy hierarchy has been implemented and calculated reduction in emissions over a notional baseline. The development employs an efficient building fabric, including well insulated walls and highly efficient glazing and efficient systems. The refurbishment demonstrates a 5% reduction in CO2 emissions over the baseline at the Be Lean stage, and the extension demonstrates a 31% saving over the Part L 2013 notional baseline

The refurbishment demonstrates a 59.2% reduction in CO2 emissions over the baseline at the Be Green stage. The extension demonstrates a 80.6% improvement over the 2013 Building regulations

The figures within this report are based on preliminary analysis only and further detailed studies will be required at the detailed design stage before specifying any of the proposed systems.

5 Appendix

5.1 Part L 2021

The development has also been tested under the new Part L 2021, in line with the GLAs revised guidance, released in June 2022. The results of the simulation are presented below.

Targets

Table 5-01 details the energy and carbon breakdown of the baseline emissions for the refurbishment and extension.

	Electricity (kWh/yr)						Electricity CO2 (kg/yr)	Total Energy (kWh/yr)	Total CO2 (kg/yr)
	Space Heating	HW	Cooling	Pumps & Fans	Lighting	Total			
Refurbishment	30,499	16,786	0	4,469	27,056	78,809	11,512	78,809	11,512
Extension	9,490	7,885	0	2,359	2,528	22,262	3,274	22,262	3,274
Total	**39,989**	**24,671**	**0**	**6,828**	**29,584**	**101,071**	**14,786**	**101,071**	**14,786**

Table 5-01 Baseline regulated energy demand and carbon emissions per energy source

Be Lean

Table 5-02 shows the breakdown of carbon and energy use once the strategies proposed at the be lean stage are incorporated.

	Electricity (kWh/yr)						Electricity CO2 (kg/yr)	Total Energy (kWh/yr)	Total CO2 (kg/yr)
	Space Heating	HW	Cooling	Pumps & Fans	Lighting	Total			
Refurbishment	35,521	15,947	0	4,200	9,941	65,609	9,740	65,609	9,740
Extension	9,026	8,299	0	1,719	2,869	21,914	3,222	21,914	3,222
Total	**44,547**	**24,246**	**0**	**5,919**	**12,810**	**87,523**	**12,962**	**87,523**	**12,962**

Table 5-02 Be lean regulated energy demand and carbon emissions per energy source

Be Green

Table 5-03 shows the breakdown of carbon and energy use once the strategies proposed at the be green stage are incorporated.

	Electricity (kWh/yr)							Electricity CO2 (kg/yr)	Total Energy (kWh/yr)	Total CO2 (kg/yr)
	Space Heating	Hot Water	Cooling	Pumps & Fans	Lighting	PV	Total			
Refurbishment	29,370	15,947	0	4,200	9,941	-7,264	52,194	7,854	52,194	7,854
Extension	7,470	8,299	0	1,719	2,869	-7,264	13,093	2,048	13,093	2,048
Total	**36,840**	**24,246**	**0**	**5,919**	**12,810**	**-14,528**	**65,287**	**9,902**	**65,287**	**9,902**

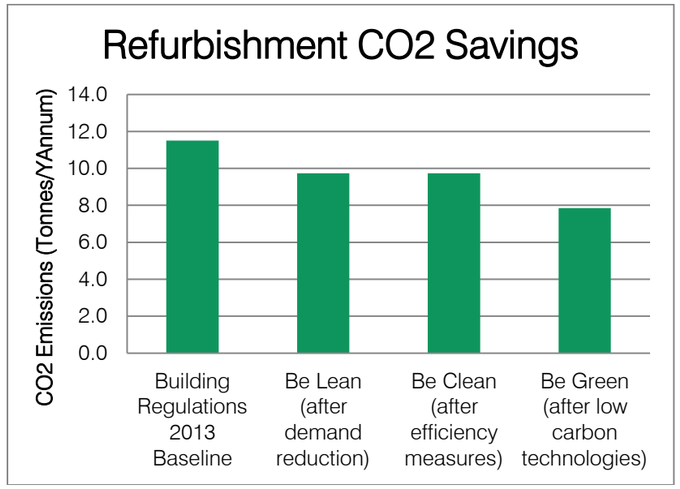
Table 5-03 Baseline regulated energy demand and carbon emissions per energy source

Carbon Savings

Table 5-04 and Figure 5-01 demonstrate the percentage improvement over the baseline for the refurbishment with Be Green measures incorporated. The refurbishment demonstrates a 31.8% reduction in CO2 emissions over the baseline at the Be Green stage. The extension demonstrates a 37.5% improvement over the 2021 Building regulations

	Refurbishment			Extension		
	CO_2 Emissions (tonnes/annum)	CO_2 Savings (tonnes/annum)	% Saving	CO_2 Emissions (tonnes/annum)	CO_2 Savings (tonnes/annum)	% Saving
Baseline	11.5			3.3		
Be Lean	9.7	1.8	15.4%	3.2	0.1	1.6%
Be Clean	9.7	0.0	0.0%	3.2	0.0	0.0%
Be Green	7.9	1.9	16.4%	2.0	1.2	35.8%
Total		3.7	31.8%		1.2	37.5%

Table 5-04 Be Green improvements over the baseline emissions



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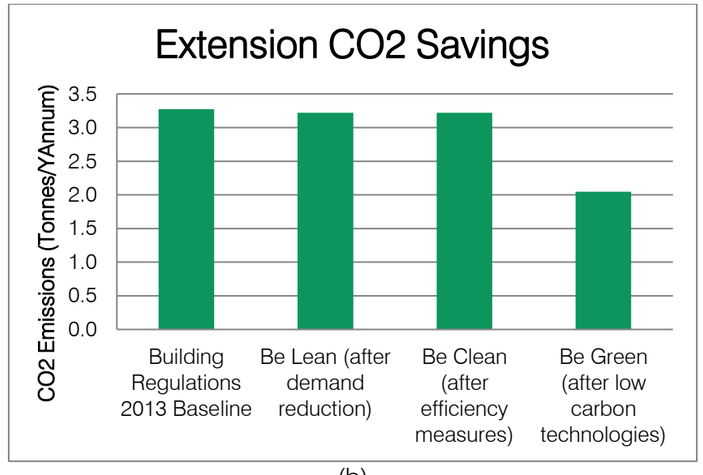

(b)

Figure 5-01 Be Green improvement over the baseline emissions (a) refurbishment (b) extension

5.2 BRUKL Output Documents

The BRUKL output documents for the Extension and Refurbishment are shown below.

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

220810 Harefield Academy_existing_baseline

As designed

Date: Wed Aug 10 16:31:03 2022

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.15

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.15

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

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	12.3
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	12.3
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	18.1
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.3	0.3	L0000003:Surf[1]
Floor	0.25	0.25	0.25	L0000003:Surf[0]
Roof	0.25	0.18	0.18	L0000035:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.33	1.33	SP000002:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* 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	10

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- Baseline Gas

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

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.91	-
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.

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**
L00_hygiene room	-	2	0	-	-	-	-	-	-	-	N/A
L00_medical	-	2	0	-	-	-	-	-	-	-	N/A
L00_office	-	2	0	-	-	-	-	-	-	-	N/A
L00_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L00_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L00_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L00_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L00_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L01_classroom 9	-	2	0	-	-	-	-	-	-	-	N/A
L01_classroom 8	-	2	0	-	-	-	-	-	-	-	N/A
L01_small hygiene	-	2	0	-	-	-	-	-	-	-	N/A
L01_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L01_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L01_wc	-	-	0.4	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L01_classroom 7	-	2	0	-	-	-	-	-	-	-	N/A
L01_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L01_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L02_speech & language	-	2	0	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.4	-	-	-	-	-	-	-	N/A
L02_snoezelen room	-	2	0	-	-	-	-	-	-	-	N/A
L02_classroom food tech	-	2	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L00_changing room	60	-	-	205
L00_changing room	60	-	-	213
L00_circ	-	60	-	75
L00_circ	-	60	-	51
L00_store	60	-	-	11
L00_fitness room	-	60	-	195
L00_head office	60	-	-	356
L00_hygiene room	60	-	-	233
L00_indepedent living	-	60	-	122
L00_it comms	60	-	-	82
L00_kitchen	-	60	-	319
L00_medical	60	-	-	241
L00_office	60	-	-	242
L00_parent room	60	-	-	156
L00_plant room	60	-	-	140
L00_plant room	60	-	-	96
L00_quiet dining	60	-	-	463
L00_reception	-	60	60	185
L00_stairs	-	60	-	73
L00_stairs	-	60	-	70
L00_store	60	-	-	9
L00_store	60	-	-	3
L00_store	60	-	-	16
L00_wc	-	60	-	52
L00_wc	-	60	-	57
L00_wc	-	60	-	52

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L00_wc	-	60	-	49
L00_wc	-	60	-	38
L01_store	60	-	-	10
L01_staff room	60	-	-	452
L01_stairs	-	60	-	66
L01_classroom 9	60	-	-	589
L01_breakout room	60	-	-	148
L01_team leader	60	-	-	148
L01_store	60	-	-	12
L01_curriculum lead	60	-	-	196
L01_circ	-	60	-	54
L01_classroom 8	60	-	-	497
L01_store	60	-	-	10
L01_small hygiene	60	-	-	180
L01_breakout room	60	-	-	168
L01_stairs	-	60	-	57
L01_wc	-	60	-	45
L01_wc	-	60	-	47
L01_store	60	-	-	11
L01_wc	-	60	-	43
L01_wc	-	60	-	41
L01_store	60	-	-	9
L01_classroom 7	60	-	-	463
L01_store	60	-	-	6
L01_circ	-	60	-	256
L01_breakout room	60	-	-	114
L01_wc	-	60	-	39
L01_wc	-	60	-	38
L01_staff workroom	60	-	-	286
L02_store food tech	60	-	-	20
L02_store faculty	60	-	-	20
L02_circ	-	60	-	56
L02_store	60	-	-	6
L02_store phusio	60	-	-	16
L02_wc	-	60	-	45
L02_wc	-	60	-	38
L02_wc	-	60	-	47
L02_wc	-	60	-	30
L02_wc	-	60	-	5
L02_store cleaner	60	-	-	9
L02_circ	-	60	-	43
L02_lift lobby	-	60	60	104
L02_speech & language	60	-	-	219

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L02_wc	-	60	-	50
L02_store	60	-	-	13
L02_meeting room	60	-	-	201
L02_snoezelen room	60	-	-	459
L02_occu therapy	60	-	-	369
L02_store	60	-	-	5
L02_physio	60	-	-	328
L02_store occu therapy	60	-	-	24
L02_library	60	-	-	755
L02_conference room	60	-	-	447
L02_store	60	-	-	5
L02_classroom food tech	60	-	-	1105
L02_circ	-	60	-	229
L00_atrium	-	60	-	446
L02_stairs	-	60	-	89
L02_stairs	-	60	-	75

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?
L00_changing room	N/A	N/A
L00_changing room	N/A	N/A
L00_fitness room	NO (-76.3%)	NO
L00_head office	NO (-88.2%)	NO
L00_hygiene room	N/A	N/A
L00_indepedent living	NO (-96.8%)	NO
L00_it comms	N/A	N/A
L00_medical	NO (-91%)	NO
L00_office	NO (-68.3%)	NO
L00_parent room	NO (-13.6%)	NO
L00_quiet dining	NO (-67.8%)	NO
L00_reception	NO (-49.4%)	NO
L01_staff room	NO (-64.5%)	NO
L01_classroom 9	NO (-74.7%)	NO
L01_breakout room	NO (-50.2%)	NO
L01_team leader	NO (-78.9%)	NO
L01_curriculum lead	NO (-77.7%)	NO
L01_classroom 8	NO (-68.3%)	NO
L01_small hygiene	N/A	N/A
L01_breakout room	NO (-79.4%)	NO
L01_classroom 7	NO (-79.3%)	NO
L01_breakout room	NO (-55.3%)	NO
L01_staff workroom	NO (-92.5%)	NO
L02_lift lobby	NO (-29.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L02_speech & language	NO (-67.2%)	NO
L02_meeting room	NO (-61.8%)	NO
L02_snoezelen room	NO (-74.9%)	NO
L02_occu therapy	NO (-73.1%)	NO
L02_physio	NO (-62.8%)	NO
L02_library	NO (-70.3%)	NO
L02_conference room	NO (-85.5%)	NO
L02_classroom food tech	NO (-69.8%)	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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1668.9	1668.9
External area [m^2]	2645.1	2645.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	10	3
Average conductance [W/K]	1090.6	1226.15
Average U-value [W/m^2K]	0.41	0.46
Alpha value* [%]	10.02	10

* 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
	B8 Storage or Distribution
3	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
2	**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
95	**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/m^2]

	Actual	Notional
Heating	25.57	20.15
Cooling	0	0
Auxiliary	3.99	2.03
Lighting	17.87	11.13
Hot water	5.84	5.84
Equipment*	22.99	22.99
TOTAL**	**53.27**	**39.15**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	74.73	62.55
Primary energy* [kWh/m^2]	105.44	71.1
Total emissions [kg/m^2]	18.1	12.3

* 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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	74.7	0	25.6	0	4	0.81	0	0.91	0
	Notional	62.5	0	20.2	0	2	0.86	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.3	L0000003:Surf[1]
Floor	0.2	0.25	L0000003:Surf[0]
Roof	0.15	0.18	L0000035:Surf[0]
Windows, roof windows, and rooflights	1.5	1.33	SP000002:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = 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	10

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

220810 Harefield Academy_existing_be lean

As designed

Date: Wed Aug 10 16:44:30 2022

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.15

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.15

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

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	12.6
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	12.6
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.3	0.3	L0000003:Surf[1]
Floor	0.25	0.25	0.25	L0000003:Surf[0]
Roof	0.25	0.18	0.18	L0000035:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.88	2.09	SP000004:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* 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	10

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- Be Lean Gas

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

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.91	-
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.

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**
L00_hygiene room	1.2	-	-	-	-	-	-	-	-	-	N/A
L00_medical	1.2	-	-	-	-	-	-	-	-	-	N/A
L00_office	1.2	-	-	-	-	-	-	-	-	-	N/A
L00_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L00_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L00_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L00_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L00_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_classroom 9	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_classroom 8	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_small hygiene	1.2	-	-	-	-	-	-	-	-	-	N/A
L01_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_wc	0.3	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_classroom 7	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L02_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L02_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L02_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L02_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L02_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L02_speech & language	0.3	-	-	-	-	-	-	-	-	-	N/A
L02_wc	0.3	-	-	-	-	-	-	-	-	-	N/A
L02_snoezelen room	0.3	-	-	-	-	-	-	-	-	-	N/A
L02_classroom food tech	0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L00_changing room	145	-	-	85
L00_changing room	145	-	-	88
L00_circ	-	145	-	31
L00_circ	-	145	-	21
L00_store	120	-	-	5
L00_fitness room	-	95	-	123
L00_head office	95	-	-	225
L00_hygiene room	95	-	-	147
L00_indepedent living	-	95	-	77
L00_it comms	120	-	-	41
L00_kitchen	-	120	-	159
L00_medical	95	-	-	152
L00_office	95	-	-	153
L00_parent room	95	-	-	99
L00_plant room	95	-	-	88
L00_plant room	95	-	-	61
L00_quiet dining	120	-	-	232
L00_reception	-	95	80	117
L00_stairs	-	145	-	30
L00_stairs	-	145	-	29
L00_store	120	-	-	4
L00_store	120	-	-	2
L00_store	120	-	-	8
L00_wc	-	145	-	21
L00_wc	-	145	-	24
L00_wc	-	145	-	22

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L00_wc	-	145	-	20
L00_wc	-	145	-	16
L01_store	120	-	-	5
L01_staff room	95	-	-	285
L01_stairs	-	145	-	27
L01_classroom 9	95	-	-	372
L01_breakout room	120	-	-	74
L01_team leader	95	-	-	93
L01_store	120	-	-	6
L01_curriculum lead	95	-	-	124
L01_circ	-	145	-	22
L01_classroom 8	95	-	-	314
L01_store	120	-	-	5
L01_small hygiene	95	-	-	114
L01_breakout room	120	-	-	84
L01_stairs	-	145	-	24
L01_wc	-	145	-	19
L01_wc	-	145	-	19
L01_store	120	-	-	5
L01_wc	-	145	-	18
L01_wc	-	145	-	17
L01_store	120	-	-	5
L01_classroom 7	95	-	-	292
L01_store	120	-	-	3
L01_circ	-	145	-	106
L01_breakout room	120	-	-	57
L01_wc	-	145	-	16
L01_wc	-	145	-	16
L01_staff workroom	95	-	-	180
L02_store food tech	120	-	-	10
L02_store faculty	120	-	-	10
L02_circ	-	145	-	23
L02_store	120	-	-	3
L02_store phusio	120	-	-	8
L02_wc	-	145	-	18
L02_wc	-	145	-	16
L02_wc	-	145	-	20
L02_wc	-	145	-	13
L02_wc	-	145	-	2
L02_store cleaner	95	-	-	6
L02_circ	-	145	-	18
L02_lift lobby	-	145	80	43
L02_speech & language	120	-	-	110

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L02_wc	-	145	-	21
L02_store	120	-	-	7
L02_meeting room	120	-	-	101
L02_snoezelen room	120	-	-	230
L02_occu therapy	95	-	-	233
L02_store	120	-	-	3
L02_physio	95	-	-	207
L02_store occu therapy	120	-	-	12
L02_library	95	-	-	477
L02_conference room	120	-	-	224
L02_store	120	-	-	2
L02_classroom food tech	145	-	-	457
L02_circ	-	145	-	95
L00_atrium	-	145	-	184
L02_stairs	-	145	-	37
L02_stairs	-	145	-	31

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?
L00_changing room	N/A	N/A
L00_changing room	N/A	N/A
L00_fitness room	NO (-76.2%)	NO
L00_head office	NO (-88.2%)	NO
L00_hygiene room	N/A	N/A
L00_indepedent living	NO (-96.8%)	NO
L00_it comms	N/A	N/A
L00_medical	NO (-91%)	NO
L00_office	NO (-68.3%)	NO
L00_parent room	NO (-13.6%)	NO
L00_quiet dining	NO (-67.3%)	NO
L00_reception	NO (-49.4%)	NO
L01_staff room	NO (-63.8%)	NO
L01_classroom 9	NO (-74.4%)	NO
L01_breakout room	NO (-49.8%)	NO
L01_team leader	NO (-78.5%)	NO
L01_curriculum lead	NO (-77.3%)	NO
L01_classroom 8	NO (-67.8%)	NO
L01_small hygiene	N/A	N/A
L01_breakout room	NO (-79.4%)	NO
L01_classroom 7	NO (-79.1%)	NO
L01_breakout room	NO (-54.4%)	NO
L01_staff workroom	NO (-92.3%)	NO
L02_lift lobby	NO (-29.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L02_speech & language	NO (-66.6%)	NO
L02_meeting room	NO (-61.1%)	NO
L02_snoezelen room	NO (-74.6%)	NO
L02_occu therapy	NO (-73.1%)	NO
L02_physio	NO (-62.4%)	NO
L02_library	NO (-70%)	NO
L02_conference room	NO (-85.3%)	NO
L02_classroom food tech	NO (-69.6%)	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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1668.9	1668.9
External area [m^2]	2645.1	2645.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	10	3
Average conductance [W/K]	1303.58	1226.15
Average U-value [W/m^2K]	0.49	0.46
Alpha value* [%]	10.02	10

* 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
	B8 Storage or Distribution
3	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
2	**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
95	**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/m^2]

	Actual	Notional
Heating	36.56	21.54
Cooling	0	0
Auxiliary	2.52	2.03
Lighting	6.81	11.13
Hot water	5.84	5.84
Equipment*	22.99	22.99
TOTAL**	**51.73**	**40.54**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	106.87	66.85
Primary energy* [kWh/m^2]	80.38	72.79
Total emissions [kg/m^2]	14	12.6

* 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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	106.9	0	36.6	0	2.5	0.81	0	0.91	0
	Notional	66.8	0	21.5	0	2	0.86	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.3	L0000003:Surf[1]
Floor	0.2	0.25	L0000003:Surf[0]
Roof	0.15	0.18	L0000035:Surf[0]
Windows, roof windows, and rooflights	1.5	1.33	SP000002:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = 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	10

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

220810 Harefield Academy_existing_be green

As designed

Date: Wed Aug 10 14:15:07 2022

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.15

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.15

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

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	12.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	12.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	10.6
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.3	0.3	L0000003:Surf[1]
Floor	0.25	0.25	0.25	L0000003:Surf[0]
Roof	0.25	0.18	0.18	L0000035:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.88	2.09	SP000004:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* 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	10

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- Be Green Natural heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.19	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

2- Be Green MVHR heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.19	-	0.2	-	0.8
Standard value	2.5*	N/A	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.					

3- Be Green NVHR heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.19	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

1- Be Green DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	-
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**
L00_hygiene room	-	-	-	1.2	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L00_medical	-	-	-	1.2	-	-	-	-	-	-	N/A
L00_office	-	-	-	1.2	-	-	-	-	-	-	N/A
L00_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L00_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L00_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L00_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L00_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L01_classroom 9	-	0.3	0	-	-	-	-	-	-	-	N/A
L01_classroom 8	-	0.3	0	-	-	-	-	-	-	-	N/A
L01_small hygiene	-	-	-	1.2	-	-	-	-	-	-	N/A
L01_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L01_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L01_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L01_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L01_classroom 7	-	0.3	0	-	-	-	-	-	-	-	N/A
L01_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L01_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L02_speech & language	-	0.3	0	-	-	-	-	-	-	-	N/A
L02_wc	-	-	0.3	-	-	-	-	-	-	-	N/A
L02_snoezelen room	-	0.3	0	-	-	-	-	-	-	-	N/A
L02_classroom food tech	-	0.3	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L00_changing room	145	-	-	85
L00_changing room	145	-	-	88
L00_circ	-	145	-	31
L00_circ	-	145	-	21
L00_store	120	-	-	5
L00_fitness room	-	95	-	123
L00_head office	95	-	-	225
L00_hygiene room	95	-	-	147
L00_indepedent living	-	95	-	77
L00_it comms	120	-	-	41
L00_kitchen	-	120	-	159
L00_medical	95	-	-	152
L00_office	95	-	-	153

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L00_parent room	95	-	-	99
L00_plant room	95	-	-	88
L00_plant room	95	-	-	61
L00_quiet dining	120	-	-	232
L00_reception	-	95	80	117
L00_stairs	-	145	-	30
L00_stairs	-	145	-	29
L00_store	120	-	-	4
L00_store	120	-	-	2
L00_store	120	-	-	8
L00_wc	-	145	-	21
L00_wc	-	145	-	24
L00_wc	-	145	-	22
L00_wc	-	145	-	20
L00_wc	-	145	-	16
L01_store	120	-	-	5
L01_staff room	95	-	-	285
L01_stairs	-	145	-	27
L01_classroom 9	95	-	-	372
L01_breakout room	120	-	-	74
L01_team leader	95	-	-	93
L01_store	120	-	-	6
L01_curriculum lead	95	-	-	124
L01_circ	-	145	-	22
L01_classroom 8	95	-	-	314
L01_store	120	-	-	5
L01_small hygiene	95	-	-	114
L01_breakout room	120	-	-	84
L01_stairs	-	145	-	24
L01_wc	-	145	-	19
L01_wc	-	145	-	19
L01_store	120	-	-	5
L01_wc	-	145	-	18
L01_wc	-	145	-	17
L01_store	120	-	-	5
L01_classroom 7	95	-	-	292
L01_store	120	-	-	3
L01_circ	-	145	-	106
L01_breakout room	120	-	-	57
L01_wc	-	145	-	16
L01_wc	-	145	-	16
L01_staff workroom	95	-	-	180
L02_store food tech	120	-	-	10

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L02_store faculty	120	-	-	10
L02_circ	-	145	-	23
L02_store	120	-	-	3
L02_store phusio	120	-	-	8
L02_wc	-	145	-	18
L02_wc	-	145	-	16
L02_wc	-	145	-	20
L02_wc	-	145	-	13
L02_wc	-	145	-	2
L02_store cleaner	95	-	-	6
L02_circ	-	145	-	18
L02_lift lobby	-	145	80	43
L02_speech & language	120	-	-	110
L02_wc	-	145	-	21
L02_store	120	-	-	7
L02_meeting room	120	-	-	101
L02_snoezelen room	120	-	-	230
L02_occu therapy	95	-	-	233
L02_store	120	-	-	3
L02_physio	95	-	-	207
L02_store occu therapy	120	-	-	12
L02_library	95	-	-	477
L02_conference room	120	-	-	224
L02_store	120	-	-	2
L02_classroom food tech	145	-	-	457
L02_circ	-	145	-	95
L00_atrium	-	145	-	184
L02_stairs	-	145	-	37
L02_stairs	-	145	-	31

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?
L00_changing room	N/A	N/A
L00_changing room	N/A	N/A
L00_fitness room	NO (-76.2%)	NO
L00_head office	NO (-88.2%)	NO
L00_hygiene room	N/A	N/A
L00_indepedent living	NO (-96.8%)	NO
L00_it comms	N/A	N/A
L00_medical	NO (-91%)	NO
L00_office	NO (-68.3%)	NO
L00_parent room	NO (-13.6%)	NO
L00_quiet dining	NO (-67.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00_reception	NO (-49.4%)	NO
L01_staff room	NO (-63.8%)	NO
L01_classroom 9	NO (-74.4%)	NO
L01_breakout room	NO (-49.8%)	NO
L01_team leader	NO (-78.5%)	NO
L01_curriculum lead	NO (-77.3%)	NO
L01_classroom 8	NO (-67.8%)	NO
L01_small hygiene	N/A	N/A
L01_breakout room	NO (-79.4%)	NO
L01_classroom 7	NO (-79.1%)	NO
L01_breakout room	NO (-54.4%)	NO
L01_staff workroom	NO (-92.3%)	NO
L02_lift lobby	NO (-29.2%)	NO
L02_speech & language	NO (-66.6%)	NO
L02_meeting room	NO (-61.1%)	NO
L02_snoezelen room	NO (-74.6%)	NO
L02_occu therapy	NO (-73.1%)	NO
L02_physio	NO (-62.4%)	NO
L02_library	NO (-70%)	NO
L02_conference room	NO (-85.3%)	NO
L02_classroom food tech	NO (-69.6%)	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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	1668.9	1668.9
External area [m^2]	2645.1	2645.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	10	3
Average conductance [W/K]	1303.58	1226.15
Average U-value [W/m^2K]	0.49	0.46
Alpha value* [%]	10.02	10

* 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
	B8 Storage or Distribution
3	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
2	**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
95	**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/m^2]

	Actual	Notional
Heating	10.22	7.78
Cooling	0	0
Auxiliary	2.52	2.03
Lighting	6.81	11.13
Hot water	5.32	5.84
Equipment*	22.99	22.99
TOTAL**	**24.87**	**26.78**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	4.39	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	104.77	71.6
Primary energy* [kWh/m^2]	76.36	69.09
Total emissions [kg/m^2]	10.6	12.5

* 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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	65.3	0	6.4	0	2.3	2.85	0	3.19	0
	Notional	31.9	0	3.5	0	3.4	2.56	0	----	----
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	87.8	0	8.6	0	3.5	2.85	0	3.19	0
	Notional	64.9	0	7	0	2	2.56	0	----	----
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	120.9	0	11.8	0	2.6	2.85	0	3.19	0
	Notional	86.3	0	9.4	0	1.7	2.56	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.3	L0000003:Surf[1]
Floor	0.2	0.25	L0000003:Surf[0]
Roof	0.15	0.18	L0000035:Surf[0]
Windows, roof windows, and rooflights	1.5	1.33	SP000002:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = 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	10

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

220810 Harefield Academy_extension_be lean

As designed

Date: Wed Aug 10 16:53:29 2022

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.15

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.15

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

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	11.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	11.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	7.6
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.14	0.14	SP000026:Surf[2]
Floor	0.25	0.1	0.1	SP000026:Surf[0]
Roof	0.25	0.11	0.11	L000000F:Surf[0]
Windows***, roof windows, and rooflights	2.2	0.94	0.94	SP000026:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* 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- Be Lean Gas

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

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.91	-
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.

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**
L00_classroom 01	0.3	-	-	-	-	-	-	-	-	-	N/A
L00_classroom 03	0.3	-	-	-	-	-	-	-	-	-	N/A
L00_classroom 02	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_classroom 04	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_classroom 06	0.3	-	-	-	-	-	-	-	-	-	N/A
L01_classroom 05	0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting

	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L00_circ	-	145	-	57
L00_classroom 01	95	-	-	343
L00_classroom 03	95	-	-	321
L00_group room	120	-	-	92

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L00_lobby	-	145	80	47
L00_stairs	-	145	-	31
L00_store	120	-	-	5
L00_store	120	-	-	8
L00_store	120	-	-	4
L00_classroom 02	95	-	-	322
L01_classroom 04	95	-	-	333
L01_classroom 06	95	-	-	313
L01_group room	120	-	-	86
L01_stairs	-	145	-	29
L01_store	120	-	-	5
L01_store	120	-	-	7
L01_store	120	-	-	4
L01_classroom 05	95	-	-	315
L01_lift lobby	-	145	80	48
L01_circ	-	145	-	57

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?
L00_classroom 01	NO (-74.3%)	NO
L00_classroom 03	NO (-52.5%)	NO
L00_group room	NO (-85.1%)	NO
L00_lobby	NO (-35%)	NO
L00_classroom 02	NO (-58.6%)	NO
L01_classroom 04	NO (-60.7%)	NO
L01_classroom 06	NO (-34.5%)	NO
L01_group room	NO (-75%)	NO
L01_classroom 05	NO (-39.3%)	NO
L01_lift lobby	NO (-31.6%)	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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	644.8	644.8
External area [m^2]	1195.1	1195.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	245.63	527.2
Average U-value [W/m^2K]	0.21	0.44
Alpha value* [%]	10.26	10

* 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
	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
100	**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/m^2]

	Actual	Notional
Heating	9.45	16.28
Cooling	0	0
Auxiliary	2.5	3.37
Lighting	4.17	8.3
Hot water	9.56	9.56
Equipment*	12.47	12.47
TOTAL**	**25.68**	**37.51**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	27.63	50.54
Primary energy* [kWh/m^2]	43.67	66.45
Total emissions [kg/m^2]	7.6	11.5

* 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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	27.6	0	9.5	0	2.5	0.81	0	0.91	0
	Notional	50.5	0	16.3	0	3.4	0.86	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.14	SP000026:Surf[2]
Floor	0.2	0.1	SP000026:Surf[0]
Roof	0.15	0.11	L000000F:Surf[0]
Windows, roof windows, and rooflights	1.5	0.94	SP000026:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = 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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

220810 Harefield Academy_extension_be green

As designed

Date: Wed Aug 10 12:48:38 2022

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.15

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.15

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

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	11.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	11.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	3.5
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.14	0.14	SP000026:Surf[2]
Floor	0.25	0.1	0.1	SP000026:Surf[0]
Roof	0.25	0.11	0.11	L000000F:Surf[0]
Windows***, roof windows, and rooflights	2.2	0.94	0.94	SP000026:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values $[W/(m^2K)]$

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values $[W/(m^2K)]$

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values $[W/(m^2K)]$

* 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- Be Green Natural heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.19	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

2- Be Green NVHR heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.19	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- Be Green DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	-
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**
L00_classroom 01	-	0.3	0	-	-	-	-	-	-	-	N/A
L00_classroom 03	-	0.3	0	-	-	-	-	-	-	-	N/A
L00_classroom 02	-	0.3	0	-	-	-	-	-	-	-	N/A
L01_classroom 04	-	0.3	0	-	-	-	-	-	-	-	N/A
L01_classroom 06	-	0.3	0	-	-	-	-	-	-	-	N/A
L01_classroom 05	-	0.3	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L00_circ	-	145	-	57
L00_classroom 01	95	-	-	343
L00_classroom 03	95	-	-	321
L00_group room	120	-	-	92
L00_lobby	-	145	80	47
L00_stairs	-	145	-	31
L00_store	120	-	-	5
L00_store	120	-	-	8
L00_store	120	-	-	4
L00_classroom 02	95	-	-	322
L01_classroom 04	95	-	-	333
L01_classroom 06	95	-	-	313
L01_group room	120	-	-	86
L01_stairs	-	145	-	29
L01_store	120	-	-	5
L01_store	120	-	-	7
L01_store	120	-	-	4
L01_classroom 05	95	-	-	315
L01_lift lobby	-	145	80	48
L01_circ	-	145	-	57

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?
L00_classroom 01	NO (-74.3%)	NO
L00_classroom 03	NO (-52.5%)	NO
L00_group room	NO (-85.1%)	NO
L00_lobby	NO (-35%)	NO
L00_classroom 02	NO (-58.6%)	NO
L01_classroom 04	NO (-60.7%)	NO
L01_classroom 06	NO (-34.5%)	NO
L01_group room	NO (-75%)	NO
L01_classroom 05	NO (-39.3%)	NO
L01_lift lobby	NO (-31.6%)	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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	644.8	644.8
External area [m^2]	1195.1	1195.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	245.63	527.2
Average U-value [W/m^2K]	0.21	0.44
Alpha value* [%]	10.26	10

* 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
	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
100	**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/m^2]

	Actual	Notional
Heating	2.7	4.23
Cooling	0	0
Auxiliary	2.5	3.37
Lighting	4.17	8.3
Hot water	8.7	9.56
Equipment*	12.47	12.47
TOTAL**	**18.06**	**25.46**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	11.36	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	27.63	38.98
Primary energy* [kWh/m^2]	55.45	58.1
Total emissions [kg/m^2]	3.5	11.1

* 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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	25.6	0	2.5	0	2.7	2.85	0	3.19	0
	Notional	23.9	0	2.6	0	4.7	2.56	0	----	----
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	31.3	0	3.1	0	2.1	2.85	0	3.19	0
	Notional	66.6	0	7.2	0	1	2.56	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.14	SP000026:Surf[2]
Floor	0.2	0.1	SP000026:Surf[0]
Roof	0.15	0.11	L000000F:Surf[0]
Windows, roof windows, and rooflights	1.5	0.94	SP000026:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = 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