Parliament Hill School and William Ellis School

Sustainability Statement

September 2017

ISSUE STATUS

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Contents

Introduction

The proposed development comprises of the refurbishment and extension to both the existing William Ellis and Parliament Hill Schools, along with a new-build La Swap sixth form. The teaching block/sports hall building is a large new-build extension to the Parliament Hill School, which will be designed to achieve high thermal comfort and energy efficiency. The development is located adjacent to Hampstead Heath off Highgate Road, Camden, London.

This document reviews the design approach and subsequent sustainability credentials of the project in line with the Camden Council's policies and London Plan 2016. This document will also address the following policies of the Camden Local Plan (2017);

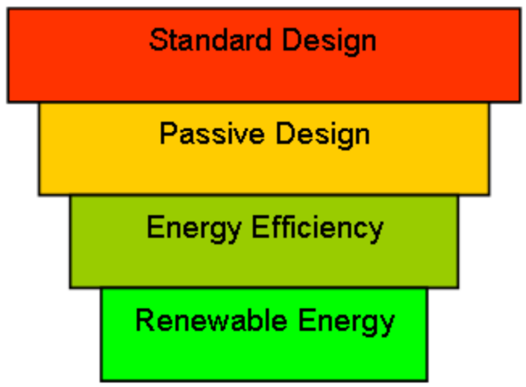
- Policy CC1 Climate change mitigation
- Policy CC2 Adapting to climate change
- Policy CC3 Water and Flooding
- Policy CC4 Air quality
- Policy CC5 Waste

Camden Council is committed to reducing Camden's carbon emissions and a big driver is to implement sustainability guidance for large scale construction projects. Buildings in Camden account for 88% of Camden's overall carbon dioxide emissions, resulting from their energy usage.

Energy Statement

To design a truly low-carbon building, the most effective approach to reducing operational energy use (and therefore carbon emissions) is to reduce the building's energy demand before then reducing its consumption. This is done by first utilising passive design measures on the building fabric ('Be lean'), before then specifying efficient systems ('Be clean') and low and zero carbon (LZC) technologies ('Be green').

This principal to efficient design can be considered as an 'energy hierarchy' as illustrated in the figure below. The inverted pyramid highlights firstly the energy consumption from a standard design. Passive design techniques should be considered firstly to minimise energy consumption, which also has other benefits such as smaller plant requirements. Then by using efficient plant and equipment, energy consumption can be further reduced. Once the energy demand overall has been minimised, then low and zero carbon technologies in the form of renewable energy can be integrated into the design to provide the remaining energy via sustainable low carbon means.



Roadmap to Efficient Design

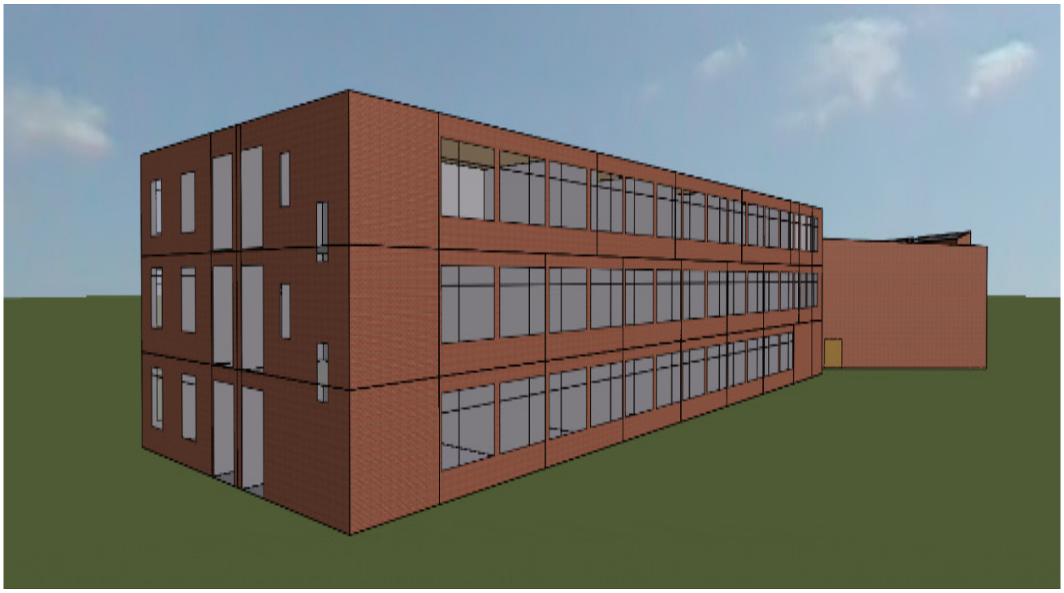
Reduce the demand for energy – Be Lean

Reducing a building's energy demand requires the use of passive measures predominantly in the design of the fabric. The following has been considered in the baseline design for the proposed new-build elements of Camden Schools:

- Building form and orientation
- Passive ventilation strategy (Natural Ventilation with Mechanical Recirculation)
- Minimising air leakage
- Exposing thermal mass (to benefit natural cooling)
- High efficiency glazing
- High performance insulation

The glazing is perhaps the aspect of building design that requires the greatest compromise in order to reduce heat loss in the winter and heat gain in the summer, whilst providing sufficient openings to promote natural ventilation and adequate daylight to the interior spaces throughout the year. Thermal modelling is a tool that enables a design team to complete an iterative exercise to achieve the optimum compromise between these four criteria. Specifying glazing with a low G-value (solar energy transmittance) will also reduce the direct solar radiation entering the rooms, which will support the aspiration to utilise natural ventilation with mechanical recirculation in as many of the occupied areas as possible.

For the proposed Camden Schools development a full thermal model for the new-build element of each building has been carried out; the results of which are fully described within the associated Part L reports and energy statements. Some images from the models are shown below:



Parliament Hill School New Teaching Block IES Model

William Ellis School Extension IES Model

Using this model we have evaluated the passive design measures that can be incorporated. The pertinent results of this for Camden Schools are:

- Mechanical ventilation with heat recovery has been assisted by natural ventilation where possible
- BB101 overheating and BREEAM/CIBSE daylighting design criteria's exceeded

- The buildings fabric has been improved in excess of the current Building Regulation Part L requirements and for the New Teaching Block
- BREEAM 'Very Good' achieved for the Parliament Hill School and La Swap buildings

Supply energy efficiently – Be Clean

Once passive design measures have been exhausted, the remaining energy demand should be utilised efficiently which is achieved primarily through active design. Occupancy & daylight sensors on lighting systems and heat recovery on the mechanical ventilation systems are good examples of energy efficient active design measures that can be incorporated on the mechanical and electrical systems of a building.

Ensuring good controllability and zoning of all systems can also significantly improve the operational efficiency of a building. Various areas of the building that are likely to have different occupancy profiles should be designed to enable the user to heat solely the occupied areas, therefore reducing wasted energy.

The electrical consumption of the lighting is typically a large percentage of any building's regulated operational energy use. It is important to consider the specification of luminaires and control strategy to reduce the operational energy use of this system.

For the Camden Schools development we have incorporated the following where practical:

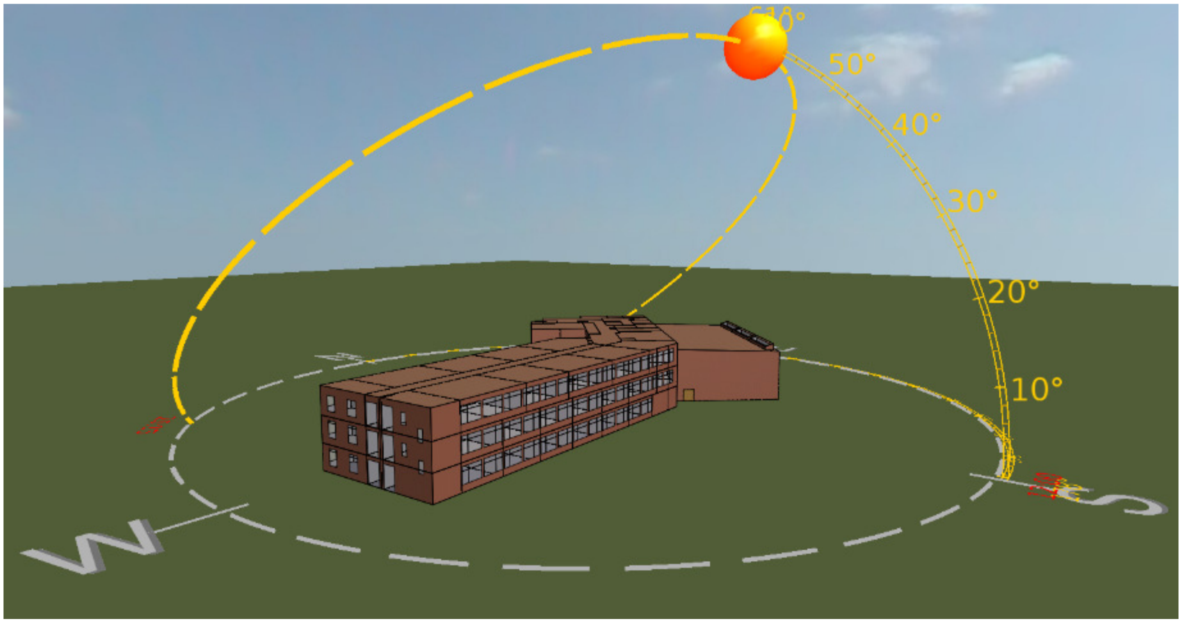
- Energy monitoring and controls dialogs
- Low energy LED lighting with daylight sensors.
- Variable speed pumps & fans
- Heat recovery on mechanical recirculation units
- High efficiency boiler plant
- Combined Heat & Power (CHP)

Use renewable energy – Be Green

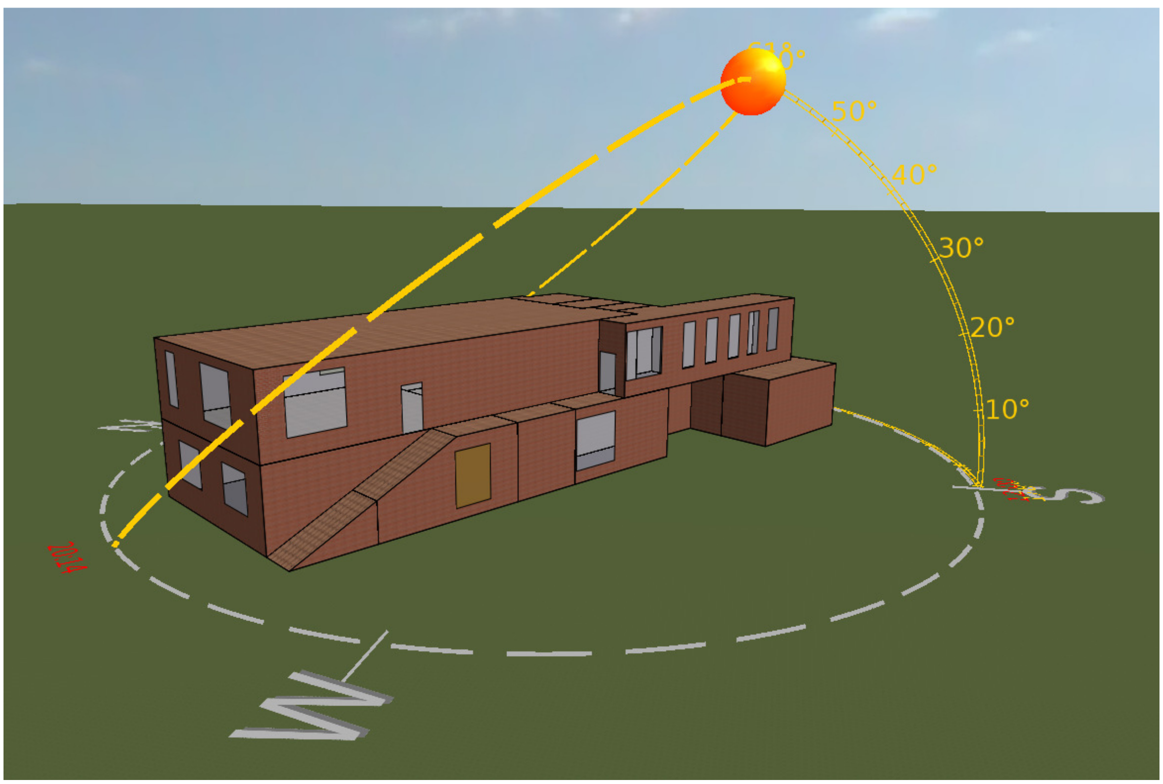
Once all passive and active design measures have been reviewed, a more accurate energy and load profile can be created for a building enabling plant to be suitably sized and specified. Low and Zero Carbon (LZC) technologies can then be assessed for their suitability for any given development. However, an assessment of the lifecycle energy, cost and carbon emissions of each system should be carried out in order to select the most appropriate solution for the development. A requirement has been set by Camden Council for a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies. With assistance from the high performance of the passive design, this target for the site is exceeded beyond the Building Regulations Part L building emission rate (BER).

A LZC technologies assessment has been carried out for each building and the results of which are summarised below.

The images below show the thermal model of each building, which has been used to assess various passive & active measures, and LZC technology on the regulated energy consumption (and resulting CO2 emissions) of each building.



Parliament Hill School IES Model



William Ellis School IES Model

The conclusions of the reports are summarised as follows:

- Solar photovoltaic panels have been identified as the most appropriate technology for the scheme to achieve good energy and carbon reductions. The design of the new roofs offers the optimal orientation and incline for the maximum panel output.

- Air source heat pumps (ASHP) are not recommended. Whilst technically feasible, the heat load of the building is predicted to be relatively high, therefore the amount of heat pumps required and total air flow rate will be exceptionally large. This will require a substantial amount of roof/adjoining space, and incur a significant noise disturbance that would require attenuation.

- Due to various site restrictions, hydro, tidal, wave and wind power have all been deemed not suitable for the development.

- Although the non-seasonal heating load (domestic hot water) of the buildings are expected to be relatively low, a suitably sized CHP engine will provide enough carbon emission reduction to make it a feasible low carbon technology to consider. This will be included in the new Parliament Hill School central plant room, sized for the domestic hot water demand of the new changing rooms and toilets.

- There is no district heating network within close proximity to the site to connect to.

- Biomass/Biofuel boilers are not recommended because of storage requirements and the increased risk with regard to fuel availability.

- The Teaching block rooms have had daylight analysis conducted across a cross selection of rooms. The areas analysed are included in this report. The daylight analysis results show that 80% of the rooms currently meet the BREEAM requirements.

LZC Technology	Suitability
Ground Source Heat Pumps	Not suitable
Air Source Heat Pumps	Only in WES
Combined Heat & Power (CHP)	Recommended
Biomass Boilers	Not suitable
Biofuel Boilers	Not suitable
Community/District Heating	Not suitable at this time
Solar Photovoltaic (PV) Panels	Recommended
Solar Thermal heating Panels	Only in absence of CHP
Wind Turbines	Not suitable
Hydro/Tidal/Wave Power	Not suitable
Water Source Heat Pumps	Not suitable

Solar thermal panels typically have payback periods in excess of 10 years (inclusive of RHI income) whereas CHP plant can pay back within 5-10 years if there is a simultaneous heat and power requirement for over 4500 hours per year. The CHP plant at Parliament Hill School has been sized to meet these criteria, otherwise known as the 'heating baseload' for the building.

The Feed-in Tariff rate has been calculated with an aim of ensuring PV panels have a return on investment (ROI) of 8% giving a payback of around 12 years. As the capital cost of PV panels decrease, the FIT rates decrease to maintain this ROI.

Therefore the scheme incorporates PV and CHP. Further information from the Part L reports and energy statements for each building has been included within the ‘Summary’ section below.

BREEAM

BREEAM (Building Research Establishment's Environmental Assessment Method) is the world's leading and most widely used environmental assessment method for buildings, with over 115,000 buildings certified and nearly 700,000 registered. It sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance. Credits are awarded in ten categories according to performance. These credits are then added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent and Outstanding. The operation of BREEAM is overseen by an independent Sustainability Board, representing a wide cross-section of construction industry stakeholders.

A BREEAM Pre-assessment has been completed on the Parliament Hill School and La Swap building and an 'Very Good' rating is targeted, although this is a reduction from Camden's Policy CC2 targets high energy performance, water consumption and materials credits have been maintained as agreed with Camden's Officers and in-line with application number: 2016/3505/P.

The schemes have been registered under the 2014 BREEAM New Construction assessment methodology (registration numbers BREEAM-0069-5445 for PHS and BREEAM-0069-5452 for La Swap). The William Ellis School development has not been considered for BREEAM assessment due to the new-build extension being less than 500m² and 25% of the overall building floor area. The dining block refurbishment has not been assessed also.

Summary

The following table summarises the sustainability credentials of each of the Camden Schools buildings:

	Parliament Hill School	**WES Extension**	**Dining Refurbishment**
BREEAM	Pre-assessment results 59.5% Very good currently (4.5% over very good requirement)	Not feasible for the small area of the new build extension. (less than 500m2 or 25% of the total building area.)	Not required energy assessment completed under a different scheme
PART L	Exceeds Part L2A 2013 with a 39.3% reduction beyond the Target emission rate	Meets Part L2A 2013	Not required - Refurbishment
BER	Teaching Block Emission rate 11.7 CO2/m2.annum	Not required for Part L2A 2013	Not required for Part L2B 2013
Camden Council Target	Exceeds the target with 39.3% saving over part L2A 2010	Not applicable under 500m2	DCLG non-compliance guide to meet Part L
London Plan 2016	Exceeds the target of 35% carbon reduction over Part L2A 2013	Not applicable under 500m2	DCLG non-compliance guide to meet Part L
LZC Technologies	Photovoltaics 25.670kwh/yr - 230m2 CHP 44kw heating, 20kw Electricity	Not applicable under 500m2	DCLG non-compliance guide to meet Part L
LZC Carbon Reduction	Contribution exceeds 20% of the BER carbon emissions	Not applicable under 500m2	DCLG non-compliance guide to meet Part L
Passivhaus standard	No longer achieved. Air permeability now increased to 3	Not Applicable	DCLG non-compliance guide to meet Part L
Overheating Analysis	TBC – once classroom requirements are confirmed	Exceeds BB101 criteria	Exceeds BB101 criteria
Day Lighting	Meets BREEAM criteria	Meets CIBSE criteria	Meets CIBSE criteria

Part L emission ratings for New Teaching Block and Sports Hall:

- Target Emission Rating (TER): 19.3 $kgCO_2/m^2/yr$;
- Dwelling Emission Rating (DER): 11.7 $kgCO_2/m^2/yr$.

Which is equivalent to a 39% carbon reduction over Part L, which is compliant with the Part L requirements of the London Plan (i.e. minimum 35% carbon reduction).

Key energy parameters for New Teaching Block and Sports Hall:

- External wall U-value: 0.13 $W/m^2.K$;
- Floor U-value: 0.13 $W/m^2.K$
- Roof U-value: 0.11 $W/m^2.K$
- Windows: 1.20 $W/m^2.K$;
- Airtightness: 3 $m^3/h/m^2$ at 50Pa;
- 230m^2 roof-mounted solar photovoltaic panels generating approx. 25,600 kWh.

Ref to Appendix One-Predicted Energy Use Assessment (PHPP) which focuses and summaries the new Teaching Block and Sports Hall energy targets.

Biodiversity and Landscaping

The landscape has been designed to support and foster biodiversity and seeks to anchor this development into the local green grid acting as a continuation of the adjacent heath.

The planting scheme is rich in native species, taking strong inspiration from the heathland landscape both in terms of species and structure. The proposed tree species are all of native origin and are species found in the local heathland landscape, species such as; Quercus robur, Alnus glutinosa, and Betula pendula.

A heath inspired meadow mix will be implemented around the periphery of the site and will include species such as; Chrysanthemum vulgare, Primula veris, and Sucissa praetensis.

The green roof to the La Swap Building will include vegetation chosen to replicate the heath and support the local flora and fauna including species similar to those at ground level; Chrysanthemum vulgare, Primula veris, Daucus carota, Plantago lanceolat, and Achillea millefolium. The biodiverse wildflower mix will make up 75% of the area with the further 25% as sedum.

The proposed green wall to the La Swap Building will be a low maintenance fixed cable system. There will be a mix of deciduous and hardy evergreen climbing species to offer seasonal interest such as; Lonicera pericylemenum 'Graham Thomas', Humulus lupulus 'Aureus', Parthenocissus henryana.

The species chosen and character of the planting scheme ensure a robust, low maintenance scheme that provides plants for pollinators and fruiting trees and shrubs to support various species of wildlife whilst maintaining a naturalistic aesthetic.

Bat and bird boxes will be included in the landscape wherever suitable. Typically existing mature trees will be the best locations as the height and dense canopy will provide suitable shelter for roosts. The roosting areas allocated for bats will be located a suitable distance from the lighting on site - most notably the area adjacent to the Games Courts Area in Parliament Hill as at times this area will be flood-lit. The bat survey identified that there is limited commuting and foraging activity across the site; by Common and Soprano Pipistrelle bats.

Wildlife foraging activity was mainly confined to the boundaries of the site and around trees in the central area. The trees surveyed were found to have no visual cavities or other suitable roosting opportunities for bats and were classified Category 3.

Any loss of potential roost sites can easily be replaced and enhanced through the erection of new bat boxes in retained trees. There will also be only a slight negative impact on foraging across the site through the loss of some trees required for the new construction. Boundary features will stay intact and new shrubs planting and landscaping with native species suitable to support foraging insects as a food source for bats and birds can mitigate the loss of the current low value resource.

Assistance will be engaged from an ecologist in the design and location of bird / bat boxes. Boxes will be situated between 4m and 6m above ground level, with entrances facing North, South-east and South-west to allow for use all year round.

Stag beetles were not recorded during the survey, as they spend the majority of their life span (3-5 years) as grub and typically emerge above ground as adults typically around June/July. In order to protect the existing Stag Beetle Grub on site where existing trees in shrub areas are felled the stump of the tree should be kept as the grub feed on the deadwood and the root structure below ground. The existing log piles on site should be kept wherever possible also. The proposed logs and log piles (in the habitat area) will make use of the wood from the felled trees across the site and will provide additional food sources for the Stag Beetle Grub.

Adaptation to the impacts of climate change

The phenomenon of climate change is a global problem, affecting both existing buildings, new developments and all aspects of life on earth. Due to the complex nature of climatology, it is difficult to predict the exact course that the global climate will take, although there are a number of key trends, for example rising global temperatures, which are generally agreed upon.

There are two key approaches that can be taken with regards to climate change:

1. Steps can be taken to mitigate the factors which lead to increased climate change.
2. Measures can be implemented to ensure that buildings are resilient enough to cope with the changing climate.

Usually, a combination of these two approaches is adopted; offering the best compromise between effectiveness and required investment. This section discusses the site's ability to adapt to the predicted effects of climate change and to be designed to be resilient to them.

Key Conditions for Climate Change Adaptations

In order to reflect the likely predicted changes in climate, four key primary effects have been identified for consideration when designing for Climate Change Adaptation.

The four key conditions are as follows:

- Hot Summers
- Extreme Snow and Ice
- Floods
- High Winds

In order to evaluate the proposed Camden Schools development site, each of the four conditions will be considered in turn, with the positive and negative features of the site investigated.

Hot Summers

Research has established that the likely average temperature increase by the end of the century will be 4.5ºC, based on the current emissions trajectory; along with a pronounced warming effect in summer, leading to temperatures regularly reaching above 40ºC in the UK.

Within the modelling carried out on Camden Schools the effect of overheating has been studied in-line with the BB101 overheating criteria for schools. There is margin within the natural ventilation system to accommodate increased external temperatures against current design standards.

Extreme Snow and Ice

Along with a predicted increase in average annual summer temperatures, Climate Change is also predicted to lead to an increased frequency of extreme snow and ice conditions.
The Camden Schools development includes additional capacity on the gas supply to allow the boiler capacity to be increased in the future as required. In addition the structure includes for the requirements of future snow loading.

Floods

It is predicted that by the 2080's the predicted level of precipitation during winter could increase by as much as 45%, under a high emissions scenario. Conversely, for the summer conditions it can be seen that the seasonal precipitate could reduce by as much as 45%, based on a high emissions scenario. With such an increase in the level of seasonal precipitation in winter, the likelihood of flooding also increases.

The site is located within Flood Zone 1 (lowest risk of fluvial flooding) with little chance of other sources of flood risk. The site area is approximately 0.8ha, therefore it falls under the 1ha threshold that would necessitate a site specific flood risk assessment to appraise surface water impacts in Zone 1.

Surface water run-off will be managed using source control methods designed in accordance with CIRIA Report C697 'The SuDs Manual' and utilising the infiltration rates set out in the Ground Investigation Report. Drainage pipes will collect flows from rainwater down pipes around the perimeter of the buildings and from impermeable areas of paving. Run-off will be limited to 18 l/s which is better than 50% reduction in existing run-off which will be achieved through onsite attenuation (548m3 total storage) with flow control, across the all buildings. The LaSwap Building will have a green roof which will provide further reduction.

Permeable paved areas will be designed to accommodate rainwater runoff generated by the critical duration 1 in 100 year (+20% climate change allowance) storm event.

High Winds

It is believed that Climate Change will lead to an increased frequency of the occurrence of extreme weather conditions; a factor which also applies to wind speeds. With a predicted increase in global temperatures, it is thought that this factor contributes to an increased occurrence of high winds.

The structure will be designed to safely withstand wind forces in accordance with the latest UK guidance which consists of a National Annex to the Eurocode. This includes allowances for extreme events and climate change. In addition the low rise buildings within the site are well protected by adjacent trees and buildings.

Use sustainable building methods and materials

The project has a high level of sustainable aspirations. As such the scheme targets:

- All materials used will have a high percentage of recycled content where possible.
- The embodied carbon content of all materials will be evaluated in the material selection and high carbon embodied materials will be avoided if possible.
- Any timber used will be responsibly sourced.
- Where possible off site manufacturer methods will be used for building and M&E elements to reduce the waste and increase the quality.
- Use local suppliers and labour where possible to reduce the carbon used in transport.

Recycle construction waste

Where possible the waste produced by the construction of the Camden Schools development will be reduced where possible by careful planning of construction materials, off site manufacturing methods where appropriate and minimising or reusing the packaging for deliveries to site.

Of the remaining construction waste, it will be recycled where practically possible having regard to relevant contractors recycling regimes.

The contractor will adhere to BREEAM WST 01 – construction waste management. A plan will be put in place to meet the BREEAM requirements as a minimum.

Incorporate water conservation measures

Water conservation is key to the scheme to minimise the impact of the building on the build environment. The proposed Camden Schools includes:

- Low flow water fittings on sinks, wash hand basins and showers.

Conclusion

The proposed scheme has been designed with sustainability and energy efficiency at the heart of the concept.

The scheme has been developed using the energy hierarchy and passive design measures enabling the applicant to achieve the high carbon reduction targets stated.

This is demonstrated through the BREEAM standards that have been committed to.

The scheme meets the planning guidance for carbon reduction as demonstrated in the summary table.

Holistic sustainability has also been addressed in the design incorporating construction, biodiversity, water use and the social/economic benefits.

Holistic sustainability has also been addressed in the design demonstrated through commitment to reducing the total impact of a development on the environment and community. The applicant has addressed reducing in use carbon, reducing water usage, built using sustainable materials, adaptable to future climate change and provide a positive contribution to the community.

Appendix One

PARLIAMENT HILL SCHOOL – TEACHING BLOCK AND SPORTS HALL

PREDICTED ENERGY USE ASSESSMENT (PHPP)

Sept 2017 | Rev C

Etude

Summary of scheme

Parliament Hill (PHS) and William Ellis (WES) schools are under going a major capital works program to improve the teaching facilities and buildings on the two sites.

The London Borough of Camden (LBC) have appointed Farrans as the main contractor for the following works:

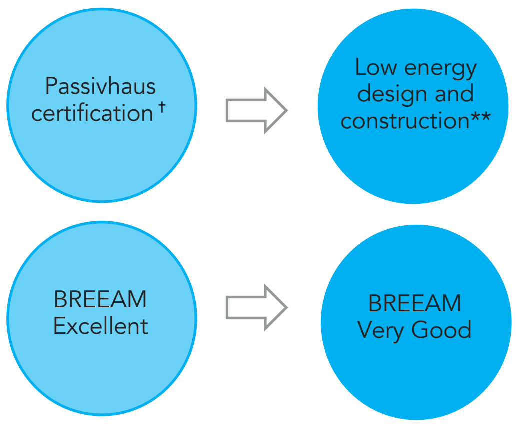
- The demolition of the Heath building and the Technology building at PHS;
- The construction of the Teaching Block and Sports Hall at PHS (5,059m^2);
- The refurbishment of a new dining hall at PHS;
- The construction of a new extension at WES (395m^2);
- The construction of a new building for LaSwap (912m^2);

This summary report focuses on the new Teaching Block and Sports Hall at PHS.

History

The previous planning application for a new building at Parliament Hill School (referred to as 'the Ribbon Building) was based on the building achieving Passivhaus certification.

Due to limitations in the budget, the Contractor has explored options to reduce costs. Camden Council have acknowledged that the environmental performance of the future building cannot be as exemplar as intended. However, Camden Council are committed to delivering a very low energy school by assessing and monitoring its performance using PHPP. Ambitious energy targets have been set for space heating demand and total energy use.

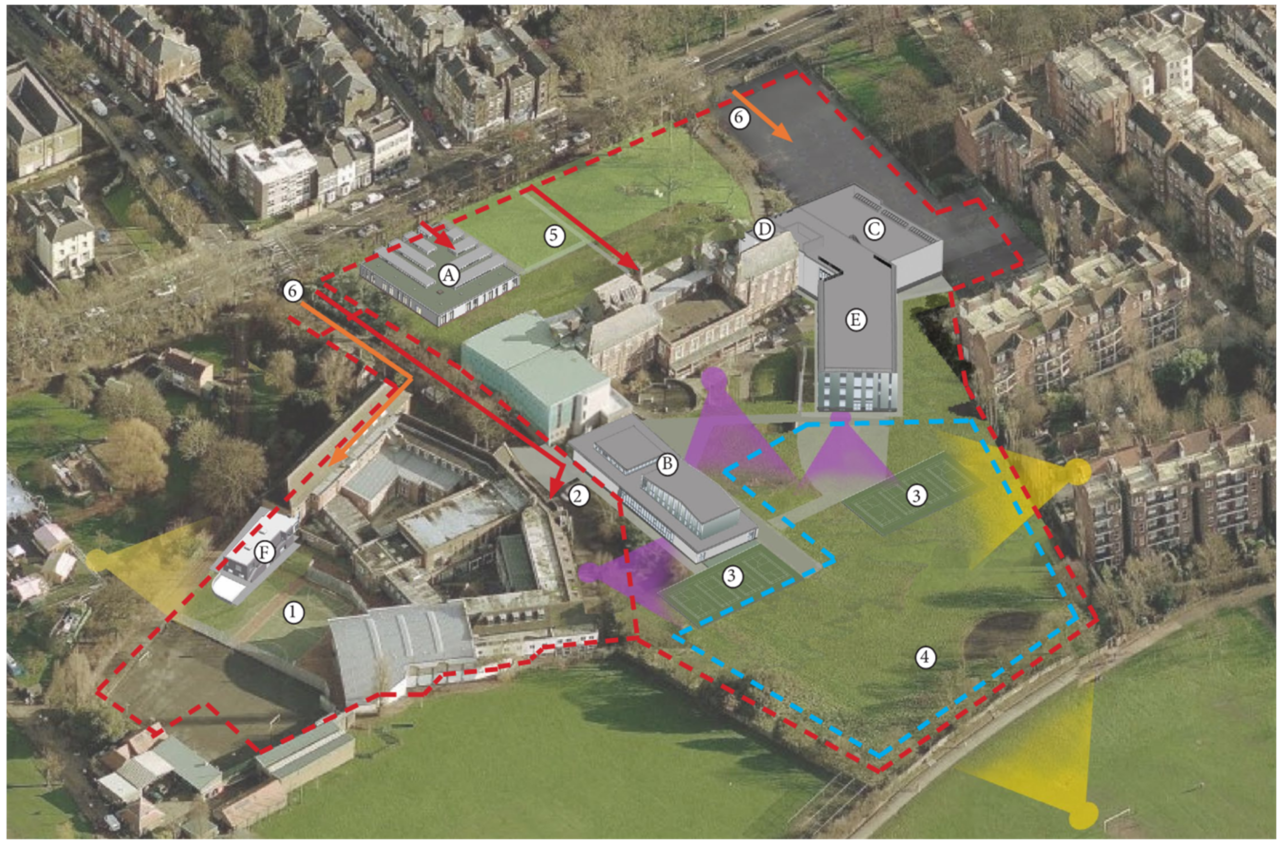


PHS – Teaching block and Sports Hall
Key sustainability targets

1 Outdoor learning activities
2 Car park
3 Proposed MUGAs (Final location still being considered)
4 MOL
5 Improve public realm
6 Vehicle entrance

External informal learning space
Vehicle access
Pedestrian access
Views to / from Hampstead Heath
Views from Schools

A Proposed LaSWAP
B Refurbished Dining Hall
C Proposed Sports Hall
D Proposed Link
E Proposed Teaching Block
F Proposed William Ellis School Extension



Overview of proposed scheme (© GSS Architecture)

† *15 kWh/m²/yr for heat demand and 60 kWh/m/yr² for all energy use*
** *45 kWh/m²/yr for heat demand and 100 kWh/m²/yr for all energy use*

Purpose of this report

This summary report is provided as an appendix to the Energy Strategy Report prepared by Harvey and TBA in support of the new planning application.

The above report includes a Part L assessment of the Teaching Block and Sports Hall which indicates that the new building at PHS will achieve a 39% improvement over Part L 2013, which is compliant with the London Plan requirement.

This report focuses on predicting the future heat demand and energy consumption of the School in kWh/m^2 in order to ensure that the School will be designed and built in order to become a low energy School.

The information is presented as simply as possible to enable understanding of the broad strategies.

Teaching block and Sports Hall - Energy performance targets

The purpose of energy performance targets

In conventional new school construction 'as built' performance is consistently worse than design predictions.

Although Passivhaus Certification is no longer targeted, it is Camden Council's intention to retain the quality assurance process provided by the Passivhaus standard. This is to actively address the 'performance gap' between predicted and actual energy consumption of the new building at PHS.

Methodology

To maintain best value for Camden Council and the school revised energy performance targets for the Teaching Block and Sports Hall have been agreed with the planning officers.

The following is an extract of the requirements from Camden Council:

i) *Prior to commencement, a Design Stage review certifying that a maximum energy consumption of 45 kWh/m^2 for heating and 100 kWh/m^2 for all energy use and that is achievable and will be maintainable in the Development's future management and occupation.*

ii) *Within 6 months of first occupation, a Passivhaus Planning Package (PHPP) post-construction assessment demonstrating that energy performance after commissioning achieves the 45kWh/m^2 heating and 100kWh/m^2 overall energy use targets.*

This report

This summary report is the pre-planning check that these targets are achievable.

Bacground

The targets are based on four different sources:

- School energy benchmarks from CIBSE Guide F 2012
- Literature review of Display Energy Certificates (DEC) of existing school buildings.
- Case study data from Innovate UK building performance evaluation.
- Reducing the performance assumptions in the initial Passivhaus design PHPP energy modelling.

Assessment against the target

Different calculation methodologies can result in very different predictions of energy performance. To make this target robust, and to avoid unintentional reduction in performance, this target will be assessed:

- Using the Passivhaus calculation methodology and PHPP software;
- Independently by Etude on behalf of Camden council;
- Using assumptions based on design evidence and justified as a reasonable representation of proposals.
- The PHPP modelling should give a conservative design value that is a closer approximation of the 'Actual' energy performance of the building.

	Original Passivhaus target		New target
Annual heating demand[1]	15 $kWh/m^2.a$	⇨	45 $kWh/m^2.a$
Total annual energy consumption[1]	60 $kWh/m^2.a$	⇨	100 $kWh/m^2.a$
Building air permeability[2]	0.6 $m^3/m^2.h$	⇨	3 $m^3/m^2.h$

[1] To be calculated using PHPP software based on evidence provided by the designer

[2] As tested on completion to BS EN ISO 9972:2015 including positive and negative pressure readings

CIBSE Guide F 2012

Guide F 'Energy Efficiency in Buildings' provides very broad energy benchmarks for good practice design. This was last revised in 2012 and is a target for the whole school building, so includes energy intensive areas such as kitchens and server rooms that are not part of this building assessment. This is included for information only and is not deemed relevant to the performance target set here.

Display Energy Certificates (DEC) for existing school buildings

The Carbonbuzz database has been used to establish median design and actual performance values for existing secondary schools. There are 41 secondary schools and college buildings used in the sample with actual quoted DEC data, of which 12 also have design values.

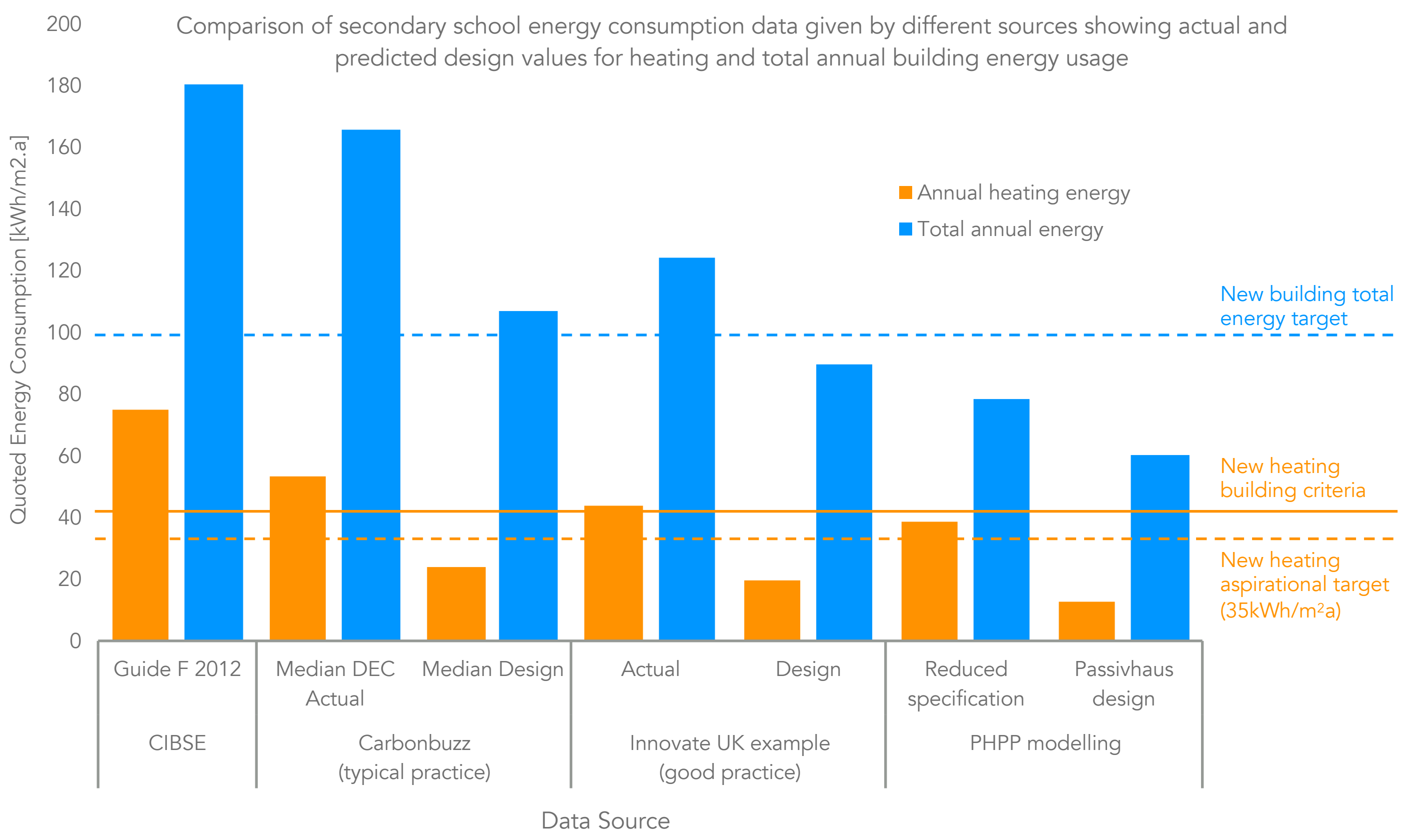
Innovate UK Building Performance Evaluation

Very detailed building performance and energy monitoring has been carried out on many of the schools from the Building Schools for the Future programme on behalf of Innovate UK (formerly TSB). Currently this data is available from Innovate UK in the form of individual case studies and 7 example secondary schools with BREEAM 'Excellent' or 'Very Good' certification have been reviewed to give an indicative median performance.

Passivhaus energy modelling

Revisions to the original Stage E PHPP energy model have been made to simulated specification reduction. Assumptions used are summarised as:

- Reduction in window performance to double glazing
- Increase in fabric air permeability to 3$m^3/m^2.h$
- Reduction in ventilation heat recovery efficiency and increase in ventilation rates.
- Increase in thermal bridging to insulation



Teaching block and Sports Hall - Energy performance targets

Description

The Teaching Block and Sports Hall will be a three storey 4,500m² extension to the South of the Parliament Hill School site, connecting to the Southern elevation of the Morant building. The building includes 3 sports halls, and approximately 40 classrooms.

The building will have a structural steel frame and is clad with rendere.

It will be serviced from the central school plant room in the Morant building, but will have separate heating and hot water circuits that can be controlled completely independently.

Key performance measures

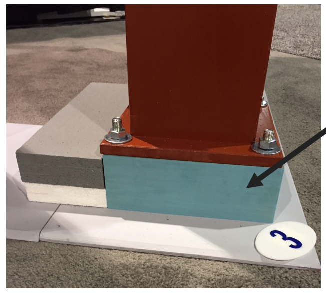
The boxes to the right describe the key features of the building for achieving sustainability performance. The items of the specification that most affect performance are summarised and the main performance criteria identified.

Building fabric

The construction is expected to achieve the following performance criteria:

Element	Minimum performance
Air tightness	3 m³/m²h @50Pa to be carried out with connecting door to the Morant building sealed shut.
Floor U-value	<0.13 W/m²K
Wall U-value	<0.14 W/m²K
Roof U-value	<0.12 W/m²K
Thermal bridging	Low (to be reviewed during detailed design)
Average window U-value	1.2 W/m²K
Average Curtain walling U-value	1.2 W/m²K
Glass g value	0.50
Entrance door U-value	High traffic entrance doors <2.60 W/m²K Other pedestrian doors <1.80 W/m²K

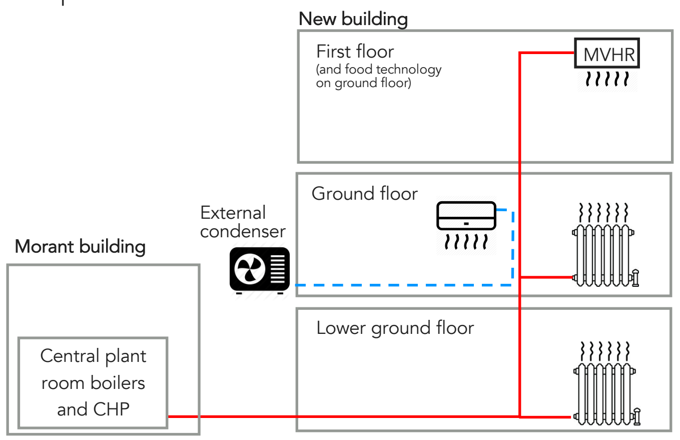
The steel frame is thermally broken wherever it passes through the external building fabric. The minimum thermal break thickness is 50mm.



Example Armatherm 500 thermal break © Armadillo

Heating & Cooling

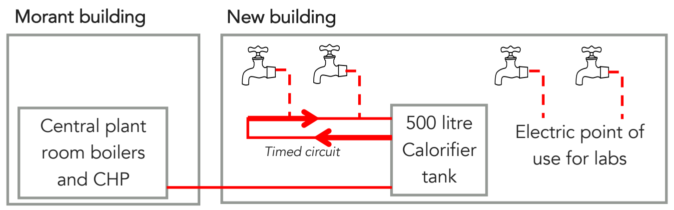
Heating is provided from the Morant building plant room on a dedicated pipe circuit. The lower ground floor and ground floor have radiators beneath the windows. The science labs and food technology will be heated with warm air from the individual MVHR units. IT classrooms and the Server room have ceiling mounted fan coil units that provide cooling and heating. All radiators will have TRV valves to allow local temperature control.



Hot water

A separate hot water circuit supplies a hot water buffer tank inside the new building. Hot water is then circulated round the building during occupied hours, with outlets drawing water as required.

The hot water circulation is controlled centrally by a time-clock and manual override. Separate circuits for the East and West ends of the building are required.

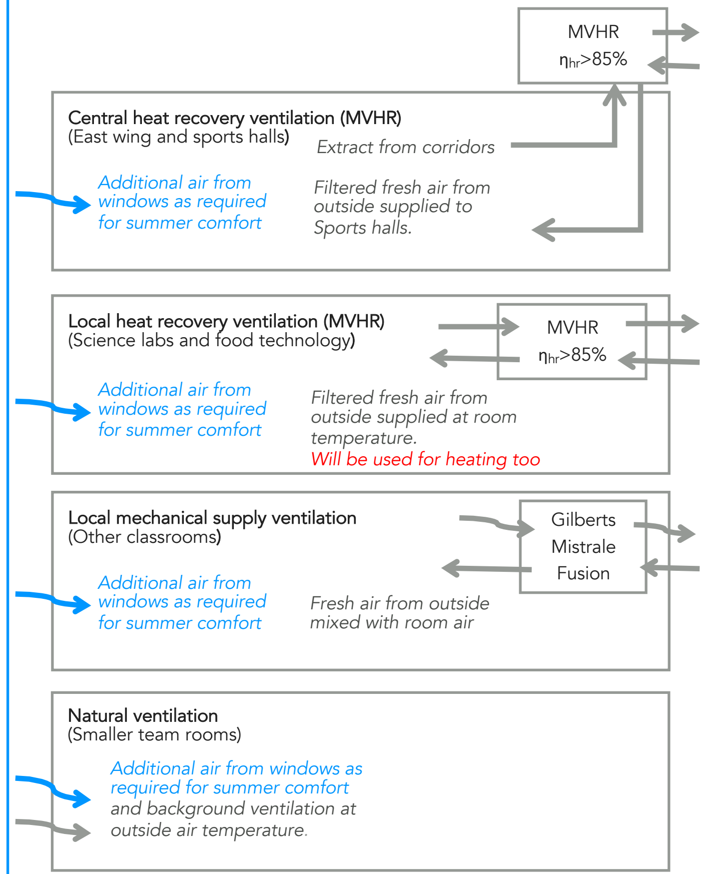


Key performance specification:

Element	Minimum performance
Hot water pipework insulation	>20mm insulation Pipe clamps mounted on the outside of the insulation. Insulation joints taped. Valves and connections insulated.
Control	Set to operate only during school hours from BMS. Manual override for out of hours with timed reset.

Ventilation

There are four ventilation strategies used in the building depending on the room type and location. These are summarised below.



Key performance specification:

Element	Minimum performance
MVHR	Heat recovery efficiency >80% Specific fan power <1.5W/l/s
Control	CO_2 occupancy sensing. Timed override boost switch for teachers. Louvre vent open/shut override for teachers with timed reset.
Duct insulation	Ducts between the fan unit and the external walls must be insulated. Minimum 25mm vapour sealed insulation.

Commissioning

The MVHR systems must be commissioned for both supply and extract fans to ensure the air flow through the heat exchangers is balanced.

Teaching block and Sports Hall - Energy performance targets

Equipment

Electrical equipment used in the building will have a large impact on the energy consumption. Much of the equipment used will be purchased by the school or moved from existing buildings, however where new equipment is purchased energy efficient equipment will be considered.

Particularly high energy users in the Teaching Block and Sports Hall are anticipated to be:

Equipment	Performance or specification
Smartboards	Good practice system with low standby power consumption and timed auto-off.
Computers	Prefer laptops or micro desktop with low standby power consumption. <20-30W should be target power consumption.
Fume cupboards	Low face velocity fume cupboards with variable air flow volume flow.
WiFi routers	Optimise number of Wifi hubs to provide coverage.

Lighting

The Teaching Block and Sports Hall are lit by low energy LED lighting throughout.

Switching is generally by a 'manual on, auto off' system, with simple rocker switches to activate lighting.

Lights within 3m of the perimeter and windows have daylight sensing and dimming.

The approach to each room type is summarised below:

Element	Minimum performance
Classrooms	Manual switch to operate lights. Absence detection switches lights off when no one is in the room for a set period of time. Daylight sensing near windows.
Corridors & stores	Lights are operated by presence detection sensors on the ceiling, and switch off after a set period of time.
Toilets	Lights are operated by presence detection sensors on the ceiling, and switch off after a set period of time.
Sports Halls	Manual switch to operate lights. Absence detection switches lights off when no one is in the room for a set period of time.
Team rooms & other	Manual switch to operate lights. Absence detection switches lights off when no one is in the room for a set period of time.

Examples of LED classroom fittings

The average lighting power density for the whole building willl be less than 8 W/m^2.

BREEAM

The Teaching Block and Sports Hall must achieve BREEAM 'Very Good'.

The key commitments included are:

BREEAM category	Key commitments
Management	Targeted Considerate Constructors Scheme (CCS) score >35/50. Building user guide and user training at handover. Commissioning (including seasonal commissioning).
Health and Wellbeing	Low VOC products Thermal comfort modelling Compliance with BREEAM acoustic criteria
Energy	Energy performance Renewable energy Energy efficient lifts Metering and sub-metering
Transport	Minimum number of cycle spaces
Water	Target water efficiency for whole building Solenoid valves on all toilet blocks
Materials	Sustainably procured timber
Waste	Recycling facilities for operational waste
Pollution	Flood risk Stormwater attenuation

Summer comfort

An overheating risk assessment has been carried out by TBA against BB101 (2006). The key strategies proposed for maintaining comfortable temperatures in the summer are listed below:

- Mechanical ventilation systems will have a summer mode that let supply air bypass the heat exchanger. During warmer weather the ventilation systems run early morning to pre-cool all the classrooms.
- Mechanical ventilation systems will be controlled on classroom temperature during the day and can increase the air flow rate up to 5 air changes per hour.
- Additional ventilation for summer comfort can be provided by opening windows.
- All glazing is designed to give some solar control and has a solar transmittance (g) value of 0.5.

An assessment of overheating risk against the draft new BB101 (2016) is recommended.

Teaching block and Sports Hall - PHPP modelling

Design performance

The Teaching Block and Sports Hall have been modelled in PHPP 9.6 software to assess the predicted energy performance against the revised energy performance criteria.

The current design as modelled gives an annual heating energy consumption of 31 Wh/m^2.yr and a total predicted energy consumption of 76 kWh/m2.yr.

This achieves both the mandatory and aspirational targets set by Camden. There is a reasonable safety margin over the targets which is recommended at this stage. This is to account for potential additional heat loss from changes to construction details and actual product values.

It should be noted that this is a preliminary design value. The final evaluation against the targets will be based on the as built construction of the school.

The modelling has been used to test the sensitivity to changes in specification. Critical areas have been identified as:

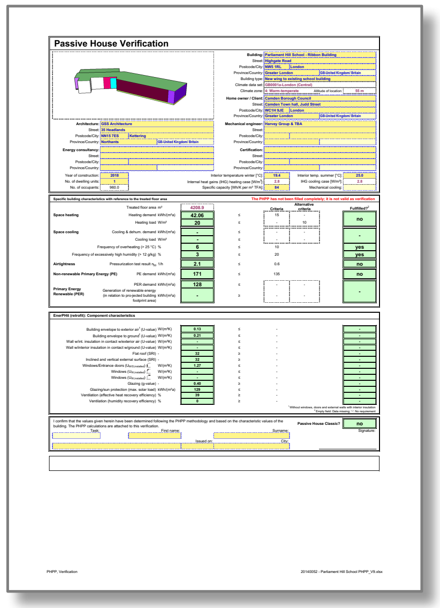
1. The installation, design and commissioning of the ventilation and demand based control system. The actual air flow rates in the building are critical to energy performance.
2. The actual performance of the curtain walling system and doors in the building. Information is required from the supplier and specialist subcontractor to confirm the performance.

Detailed design should focus on developing in detail the **design and specification of the ventilation systems** (e.g. MVHR efficiency, controls) and the **approach to building fabric performance** including a satisfactory airtightness strategy, a detailed review of window performance and the reduction of thermal bridges.

Heating energy breakdown

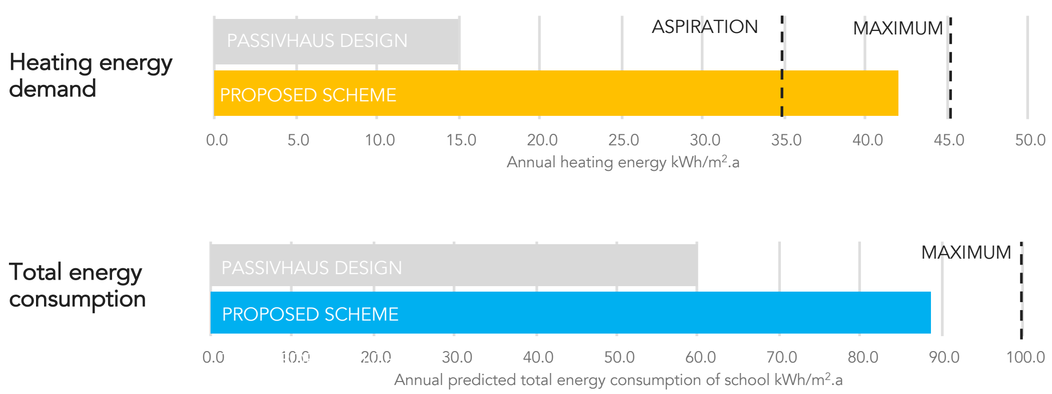
The heat loss breakdown of the current building design is shown on the adjacent figure. This shows all the heat energy flowing into and out from the building over one year. All values are given in energy per year per unit floor area (kWh/m^2.a).

The major heat losses from the building are associated with the ventilation system and conduction through the windows and walls.



PHPP Verification sheet from the building model.

Calculated design energy performance against the targets set by Camden Council



Annual steady state heating energy breakdown for the proposed Teaching Block and Sports Hall