Building Services Engineering
Sustainability Consultants
Low Carbon Design

FLATT

FOR:
Star Land Realty UK Ltd
C/o 128 Cheapside
London EC2V 6BT

BARNES HOSPITAL SITE
ENERGY STATEMENT

Engineering Sustainability

Revision

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Author

Name	Title
James Faull	SAP Assessor
Richard Goard	Associate Director

Distribution

Name	Organisation
Duncan Trench	LS Estates
Mark Sweetman	LS Estates
Paul Beadman	Beadmans
William Payne	Beadmans
Richard McCarthy	Scott Brownrigg
Olga Mikhaleva	Scott Brownrigg
Liam Guntrip	Robert Bird
Oliver Froy	Avison Young
Simon Zargar	Avison Young

Document Control

Authorisation

Originator	James Faull	Date	15/11/2021
Approved	Richard Goard	Date	21/10/2022

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REVISION LOG

The key updates included within each revision are summarised below.

- Issue 1_ 9th August 2021 - Issued to Project Team for Comment
- Issue 2_11th August 2021 – Amended with Project Team Comments.
- Issue 3_28th September 2021 – Amended to pick up LBRUT Comments – Decentralised Networks and National; Water Standards
- Issue 4_15th November 2021 – Red Line Site Plan Amended
- Issue 5_7th October 2022 – Apartment Mix Amended to latest version, Site Plan Updated, Plans & Elevations Updated, TM59 overheating checked for dormer/skylight amendments to apartments 03.07 & 03.08 and DSY1 weather criteria pass confirmed.
- Issue 6_21st October 2022 Figure 5 Plan updated

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EXECUTIVE SUMMARY

This report has been prepared by **FLATT** on behalf of **Star Land Realty UK Limited** in support of the planning application located on part of the old Barnes Hospital Site, located on the South side of the South Worple Way, East Sheen, London SW14, in the London Borough of Richmond upon Thames. The hospital site is bounded to the North by South Worple Way and the railway line which is located to the North of the South Worple Way, to the East by housing located along Buxton Road, to the South by housing located along Grosvenor Avenue and to the West by Mortlake Cemetery.

This Energy Statement outlines how the reductions in emissions are achieved through the use of Fabric Energy Efficiency (FEE) performance, energy efficient services and then through the use of low to zero carbon technologies, thereby demonstrating compliance with Building Regulations, London Plan and London Borough of Richmond Upon Thames polices.

This Statement is written in accordance with the Greater London Authority's (GLA) Energy Assessment Guidance (April 2020) and considers the London Plan (March 2021).

The London Borough of Richmond Upon Thames requires the development to achieve a 40% reduction in regulated CO_2 emissions against Building Regulations Part L1A 2010, equating to a 35% reduction against Building Regulations Part L1A 2013 with 2016 Amendments. It is proposed that air source heat pumps will be utilised to achieve these reductions.

The Energy Statement is prepared using Building Regulation 2010 (SAP 2012) and SAP 10 carbon factors according to the GLA Energy Assessment Guidance.

The results of the analysis are summarised below:

SAP2012

- Domestic
  - 11% reduction in regulated emissions compared to Building Regulations Part L1A 2013 on energy efficiency measures alone (Be Lean)
  - An overall reduction in regulated emissions of 36%
  - 24% reduction in regulated emissions attributable to renewables (ASHP)

SAP10

- Domestic
  - 14% reduction in regulated emissions compared to Building Regulations Part L1A 2013 on energy efficiency measures alone (Be Lean)
  - An overall reduction in regulated emissions of 67%
  - 53% reduction in regulated emissions attributable to renewables (ASHP)

Climate Change:

Climate Change mitigation and adaptation measures have been in incorporated within the building design strategy.
Passive design measures combined with energy efficient services and renewable technologies result in significant carbon emission reduction for the project. Monitoring of the operational energy aims to reduce the performance gap and further contribute to minimising the carbon footprint of the building.

Implementing more efficient ways of making, using and disposing of materials will allow resources to flow in a more circular pattern therefore reducing the greenhouse gas emissions and resource depletion. Consumption of potable water for sanitary use has been minimised through water efficient components.

Ecological features will aim at increasing the overall ecological value of the site while improving biodiversity but also reducing the effect of the urban heat island which is a common issue in big cities.

Adaptation to climate change has been achieved through structural and fabric durability measures addressing the potential for extreme weather conditions such as temperature fluctuations, winds and heavy rainfall. Building services design, architectural and structural solutions will ensure the building flexibility to adapt to various climate change conditions.

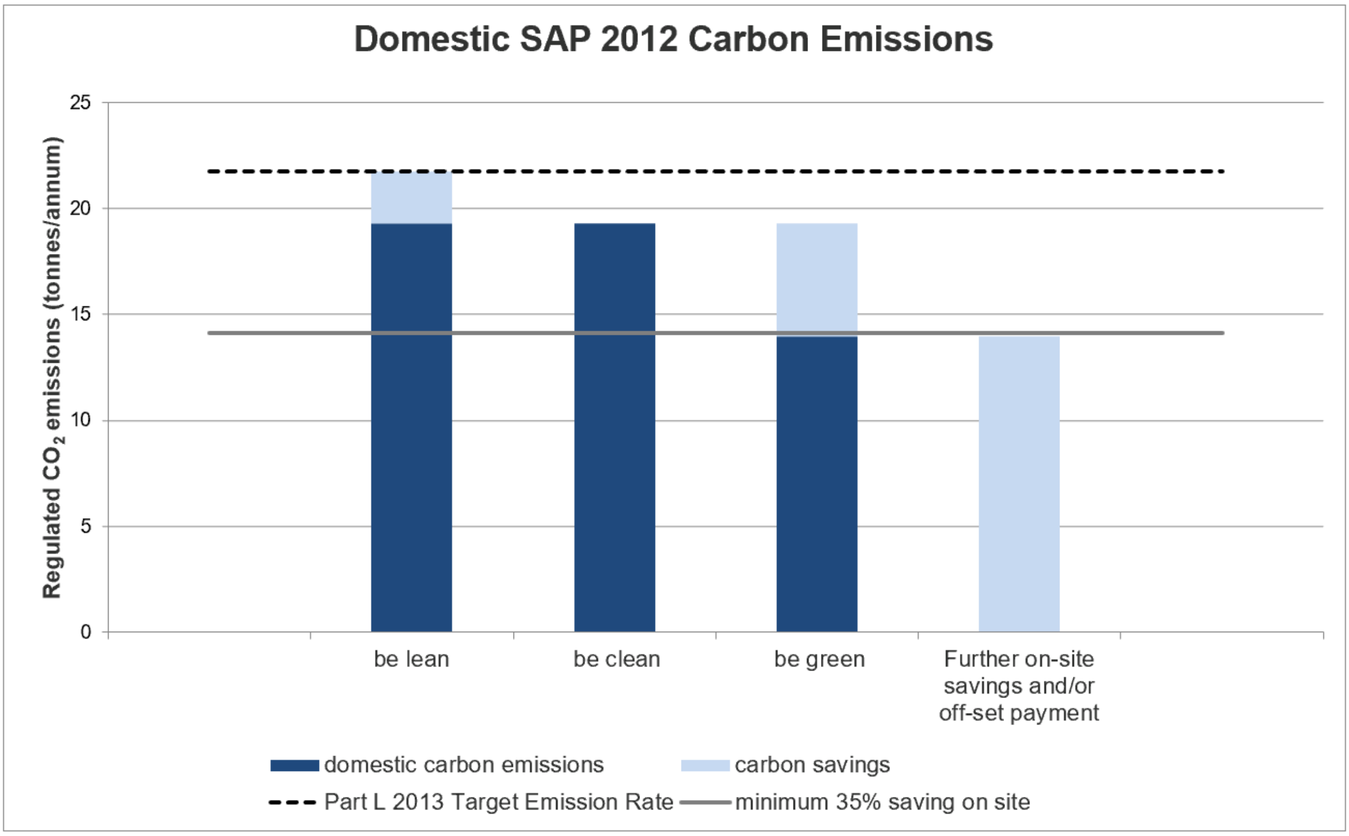


Figure 1. SAP 2012 CO_2 Emissions Reductions

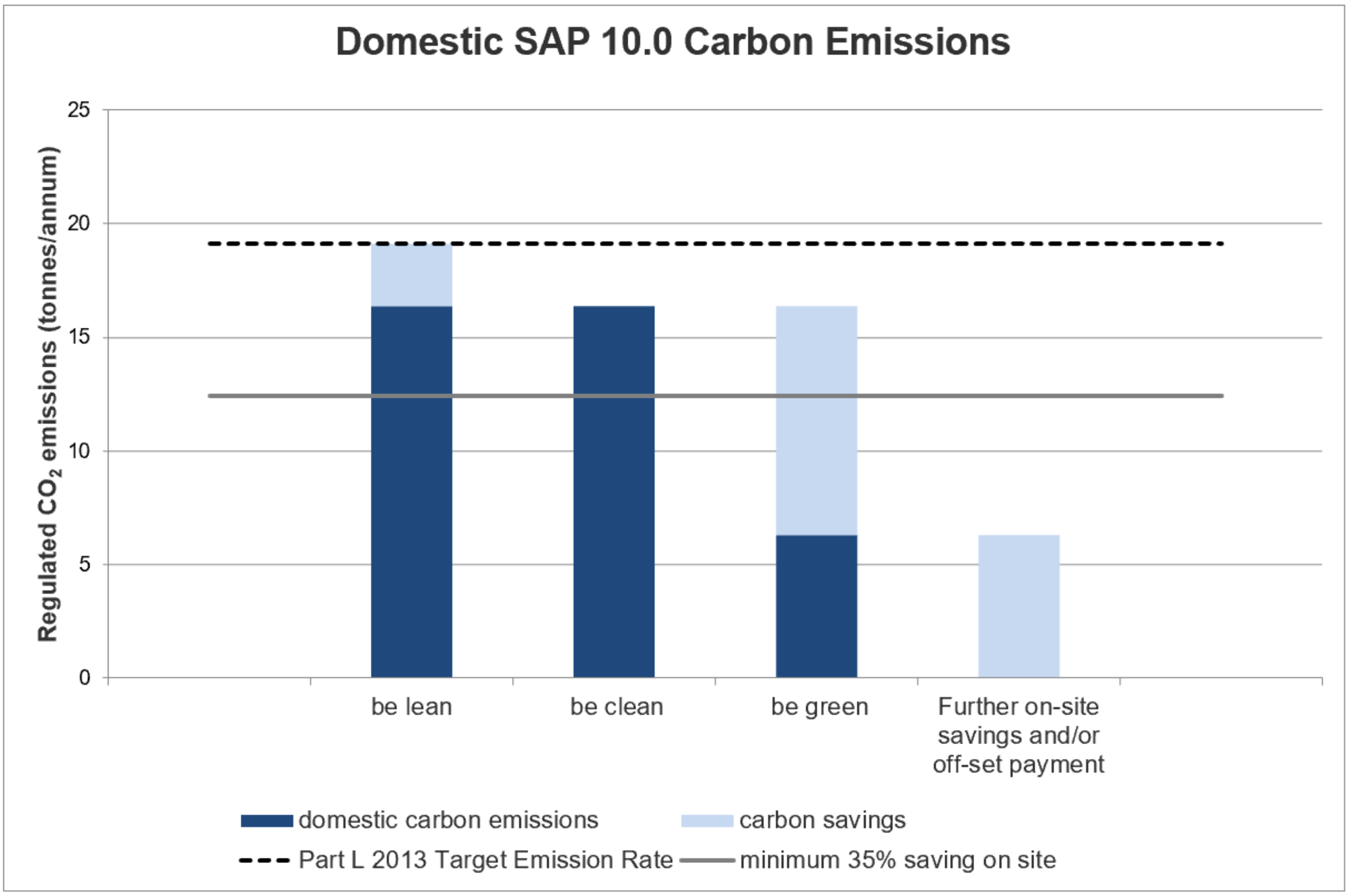


Figure 2. SAP 10.0 CO_2 Emissions Reductions

1.0 INTRODUCTION

This report has been prepared by **FLATT** in support of the planning application for the old Barnes Hospital Site in East Sheen.

This Energy Statement outlines how the reductions in emissions are achieved through the use of a high-performance building fabric, energy efficient services and then through the use of low to zero carbon technologies, thereby demonstrating compliance with the Energy Hierarchy, Building Regulations and Local Authority polices.

This report focuses on:

- Building Regulations / SAP and SBEM Compliance
- Government and Local Authority Policies
- Enhanced Building Fabric & Systems
- Low to Zero Carbon Technologies
- Renewable Energy Systems – Air Source Heat Pumps and PV Panels
- Waste Water Heat Recovery

The aim is to ensure the client, design team and local authority are fully informed as to how the development, in context to the planning conditions, will:

- Minimises its Carbon Footprint
- Maximises its Energy Efficiency

The report follows the guidance detailed within the document titled “Energy Planning - GLA Guidance on Preparing Energy Assessments” dated April 2020 as well as the adopted London Plan dated March 2021 and London Borough of Richmond Upon Thames policies.

2.0 THE DEVELOPMENT

2.1 General

Barnes Hospital is located on the South side of the South Worple Way, East Sheen, London SW14, in the London Borough of Richmond upon Thames. The hospital site is bounded to the North by South Worple Way and the railway line which is located to the North of the South Worple Way, to the East by housing located along Buxton Road, to the South by housing located along Grosvenor Avenue and to the West by Mortlake Cemetery.

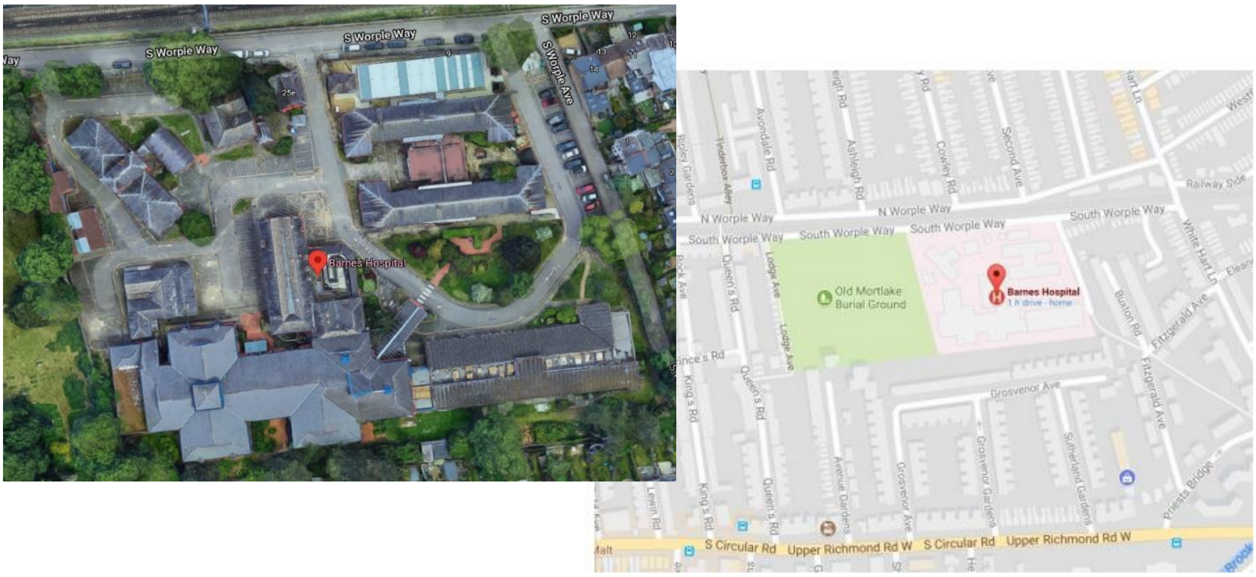
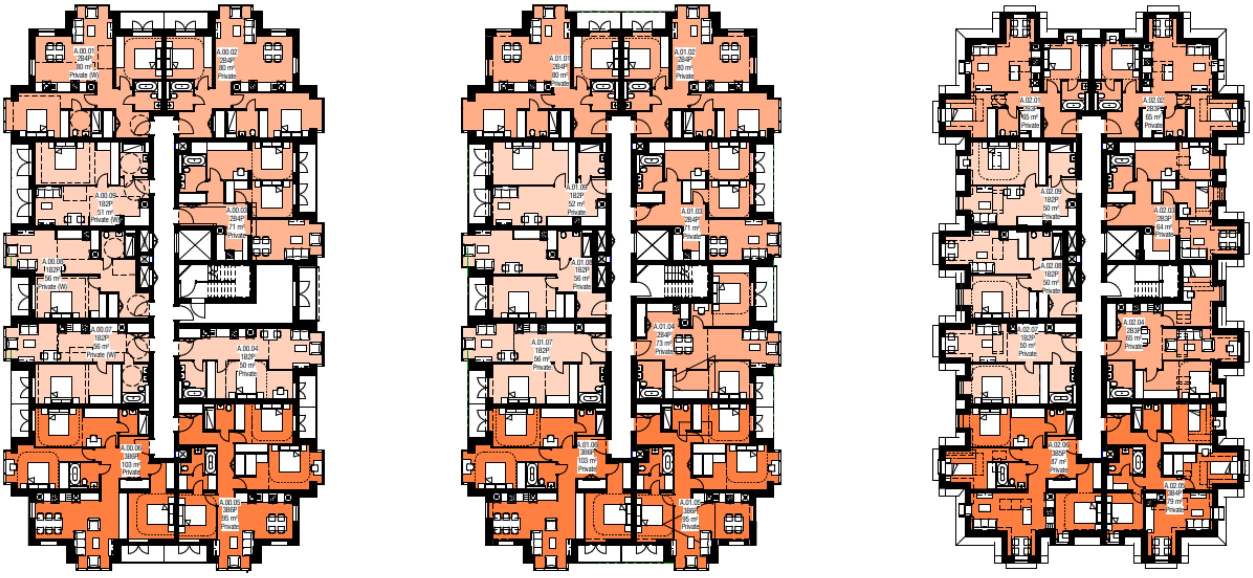


Figure 3. Barnes Hospital Site Location

Unit Size	Market		Shared Ownership		Affordable Rent		Total	
	Units	%	Units	%	Units	%	Units	%
Studio	1	1.2%	0	0%	0	0%	**1**	**0.9%**
1-bedroom	29	34.1%	5	100%	7	36.8%	**41**	**37.6%**
2-bedrooms	41	48.2%	0	0%	8	42.1%	**49**	**45%**
3-bedrooms	14	16.5%	0	0%	4	21.1%	**18**	**16.5%**
Total	**85**	**100%**	**5**	**100%**	**19**	**100%**	**109**	**100%**

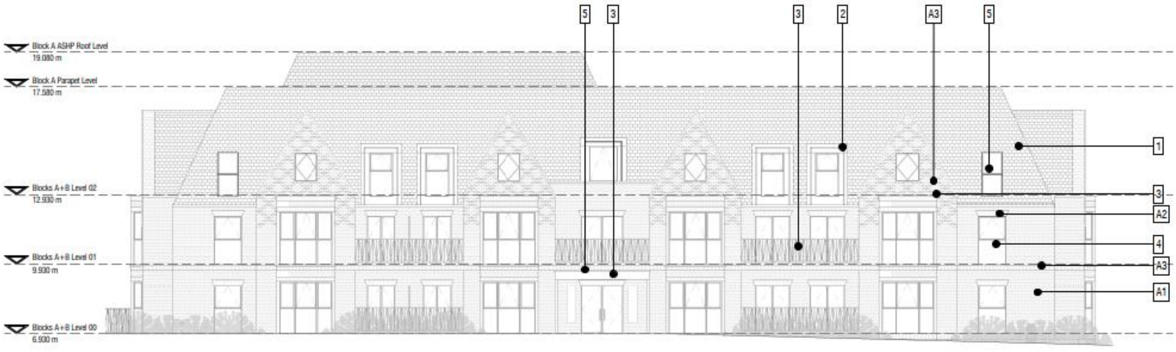
Figure 4. Apartment Mix

Figure 5. Site Plan

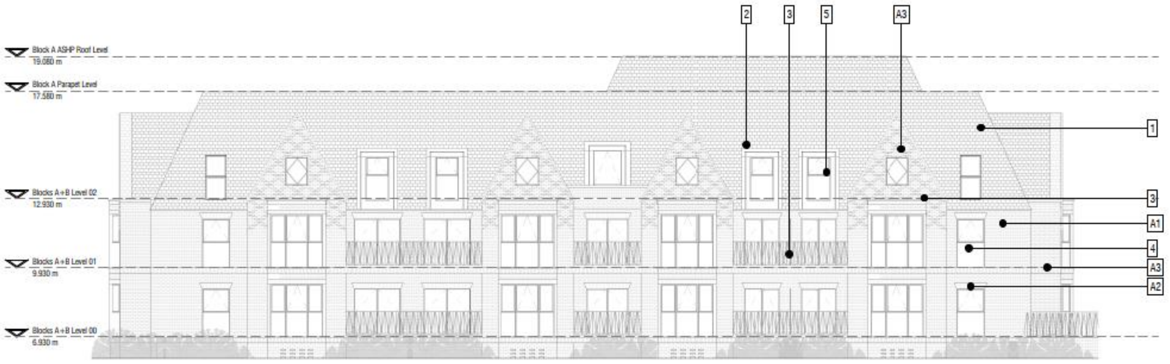


Level 00 Level 01 Level 02

Figure 6. Block A Floor Plans



1 Block A Elevation 1



2 Block A Elevation 2

Figure 7. Block A Elevations

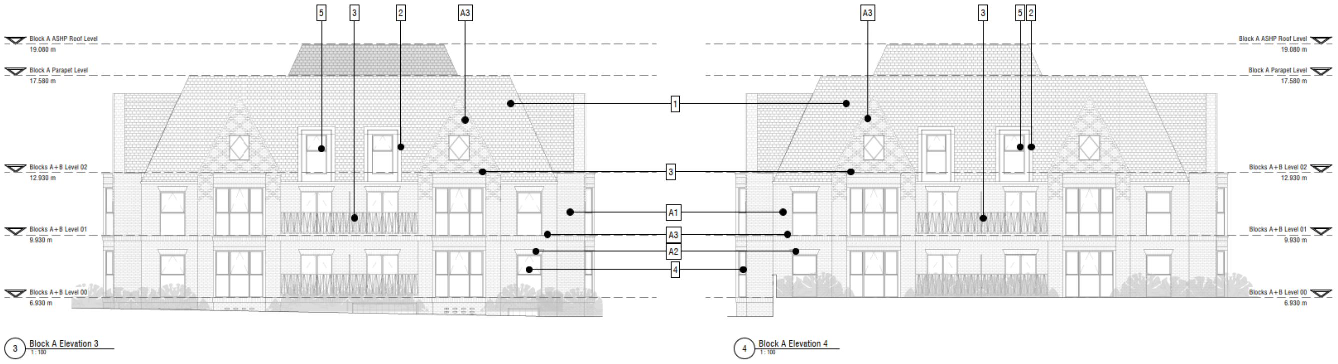
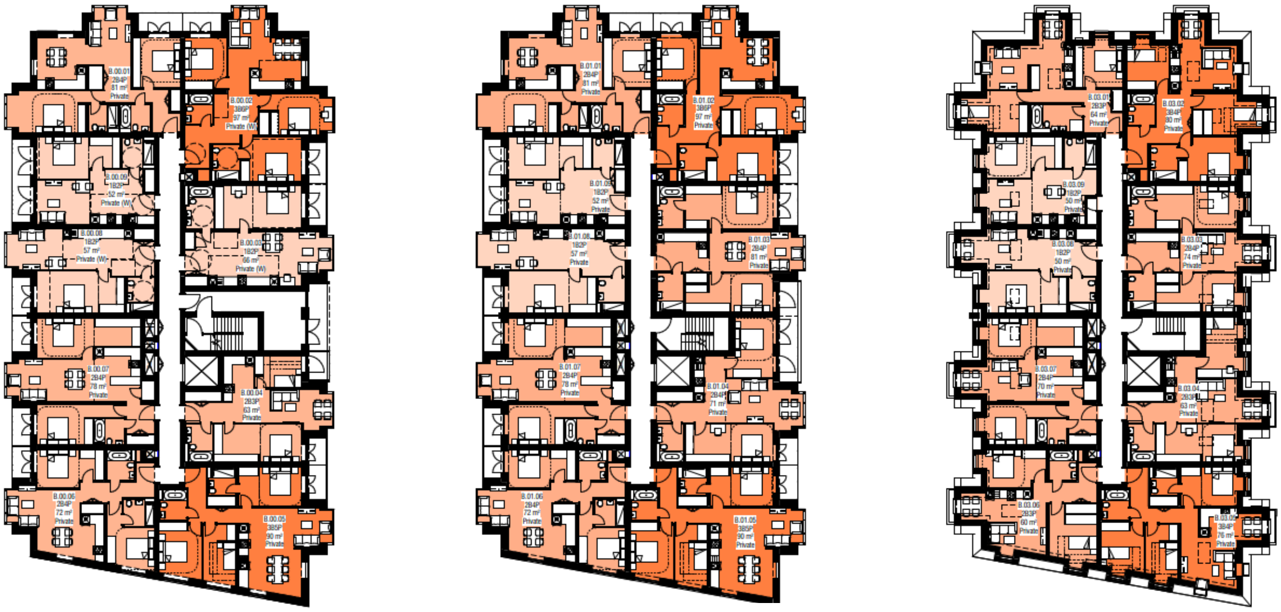


Figure 8. Block A Elevations



Level 00

Level 01 & 02

Level 03

Figure 9. Block B Floor Plans

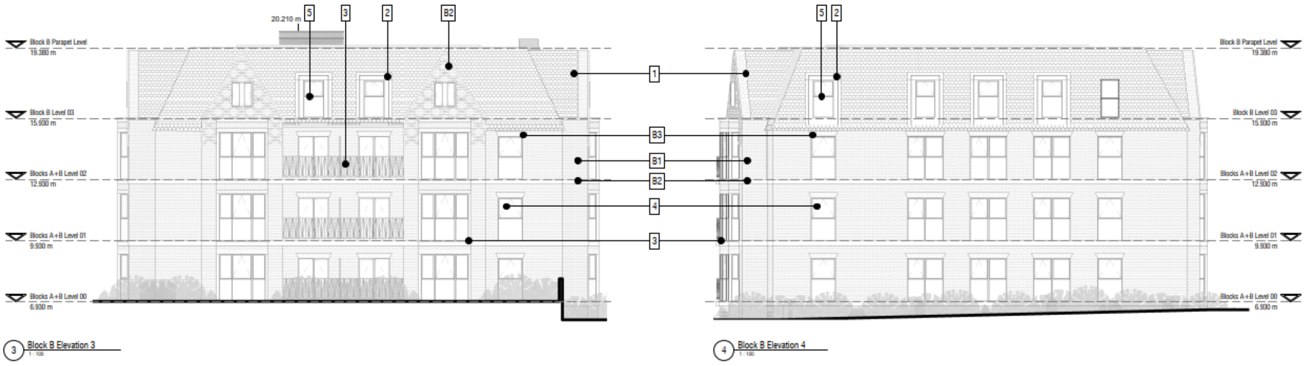


Figure 10. Block B Elevations

Figure 11. Block B Elevations

Level 00

Level 01 & 02

Level 03

Figure 12. Block C Floor Plans

Figure 13. Block C Elevations

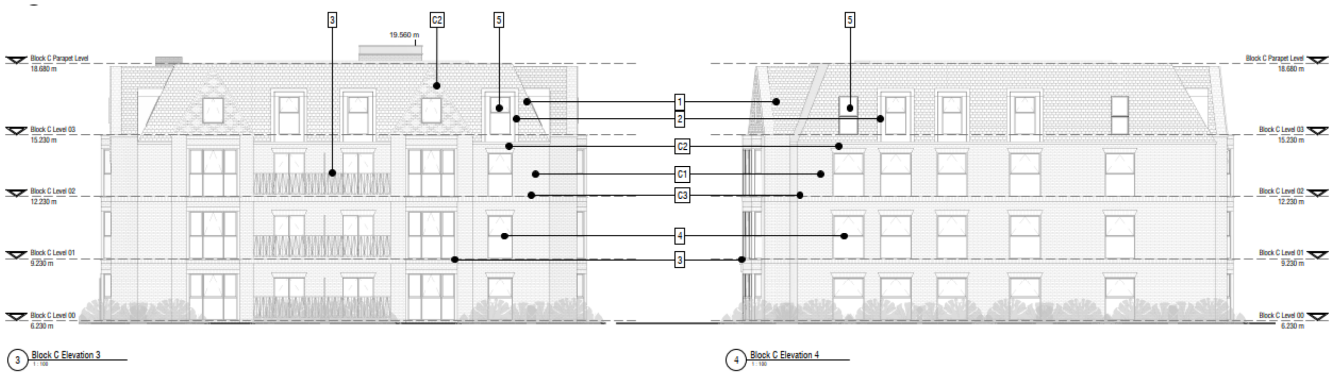


Figure 14. Block C Elevations

3.0 PLANNING POLICY & CONTEXT

3.1 National Policy

The National Planning Policy Framework (NPPF) was adopted in March 2012, updated July 2021. The framework sets out a structure for delivering sustainable development with particular relevance for energy and carbon issues.

National Planning Policy Framework

3.2 Building Regulations

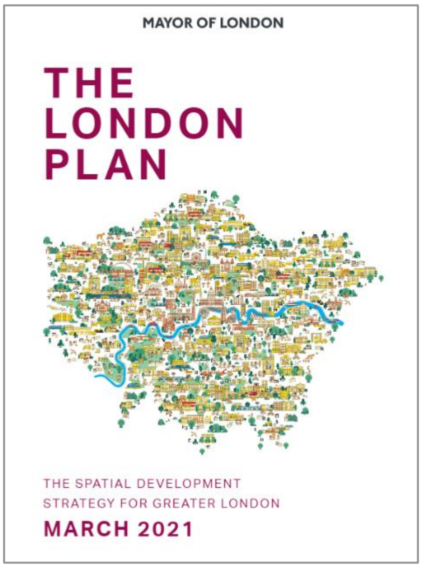
Under the initial outline planning consent this development is required to comply with Part L of the Building Regulations 2013 with 2016 Amendments.

Changes to the Building Regulations Approved Document L, which came into force in April 2016, demonstrate the continuing drive to achieve higher building fabric thermal efficiencies and services energy efficiencies.

3.3 Regional Policy – Adopted London Plan – March 2021

Strategic planning in London is the shared responsibility of the Mayor of London, 32 London boroughs and the Corporation of the City of London. Under the legislation establishing the Greater London Authority (GLA), the Mayor has produced a spatial development strategy (SDS) – which has become known as 'the London Plan. Boroughs' local development documents have to be 'in general conformity' with the London Plan, which is also legally part of the development plan that has to be taken into account when planning decisions are taken in any part of London unless there are planning reasons why it should not.

This document has been prepared in relation to the London Plan dated March 2021 and the Energy Statement Guidance dated April 2020.



MAYOR OF LONDON

THE LONDON PLAN

THE SPATIAL DEVELOPMENT STRATEGY FOR GREATER LONDON
MARCH 2021

Policy SI 1 Improving Air Quality

A. Development plans, through relevant strategic, site specific and area-based policies should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.

B. To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed:

1) Development proposals should not:
   a) lead to further deterioration of existing poor air quality
   b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits
   c) create unacceptable risk of high levels of exposure to poor air quality.
2) In order to meet the requirements in Part 1, as a minimum:
   a) Development proposals must be at least air quality neutral
   b) Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures
   c) Major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1
   d) Development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people, which do not demonstrate that design measures have been used to minimise exposure should be refused.

C. Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

a) How proposals have considered ways to maximise benefits to local air quality, and
b) What measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.

D. In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.

E. Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development.

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:

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

F. Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

Policy SI3 Energy Infrastructure

A. Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

B. Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify:
   1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
   2) heat loads from existing buildings that can be connected to future phases of a heat network
   3) major heat supply plant including opportunities to utilise heat from energy from waste plants
   4) secondary heat sources, including both environmental and waste heat
   5) opportunities for low and ambient temperature heat networks
   6) possible land for energy centres and/or energy storage
   7) possible heating and cooling network routes
   8) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works
   9) infrastructure and land requirements for electricity and gas supplies
   10) implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector
   11) opportunities to maximise renewable electricity generation and incorporate demand-side response measures.

C. Development Plans should:
   1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure
   2) identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.

D. Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system
   1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:
      a) connect to local existing or planned heat networks
      b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)

    c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
    d) use ultra-low NOx gas boilers.
2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements of policy SI1 Part B
3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

E. Heat networks should achieve good practice design and specification standards for primary, secondary, and tertiary systems comparable to those set out in the CIBSE CP1 Heat Networks: Code of Practice for the UK or equivalent.

Policy SI4 Managing Heat Risk

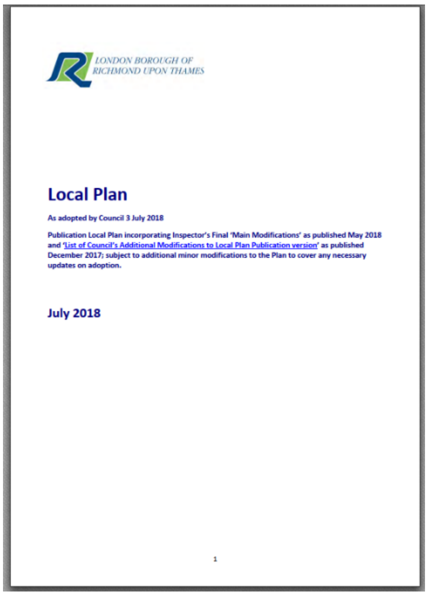
A. Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

B. Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure
2) minimise internal heat generation through energy efficient design
3) manage the heat within the building through exposed internal thermal mass and high ceilings
4) provide passive ventilation
5) provide mechanical ventilation
6) provide active cooling systems.

3.4 Local Policy – London Borough of Richmond Upon Thames

The London Borough of Richmond Upon Thames has confirmed within their Local Plan (July 2018) document their policy requirements pertinent to the Energy Statement are as below:



LONDON BOROUGH OF
RICHMOND UPON THAMES

Local Plan

As adopted by Council 3 July 2018

Publication Local Plan incorporating Inspector's Final 'Main Modifications' as published May 2018 and 'List of Council's Additional Modifications to Local Plan Publication version' as published December 2017; subject to additional minor modifications to the Plan to cover any necessary updates on adoption.

July 2018

1

Policy LP 20 Climate Change Adaption

A. The Council will promote and encourage development to be fully resilient to the future impacts of climate change in order to minimise vulnerability of people and property.

B. New development, in their layout, design, construction, materials, landscaping and operation, should minimise the effects of overheating as well as minimise energy consumption in accordance with the following cooling hierarchy:

1. minimise internal heat generation through energy efficient design
2. reduce the amount of heat entering a building in summer through shading, reducing solar reflectance, fenestration, insulation and green roofs and walls
3. manage the heat within the building through exposed internal thermal mass and high ceilings
4. passive ventilation
5. mechanical ventilation
6. active cooling systems (ensuring they are the lowest carbon options).

C. Opportunities to adapt existing buildings, places and spaces to the likely effects of climate change should be maximised and will be supported.

Policy LP 22 Sustainable Design and Construction

A. Developments will be required to achieve the highest standards of sustainable design and construction to mitigate the likely effects of climate change. Applicants will be required to complete the following:

1. Development of 1 dwelling unit or more, or 100sqm or more of non-residential floor space (including extensions) will be required to complete the Sustainable Construction Checklist SPD. A completed Checklist has to be submitted as part of the planning application.

2. Development that results in a new residential dwelling, including conversions, change of use, and extensions that result in a new dwelling unit, will be required to incorporate water conservation measures to achieve maximum water consumption of 110 litres per person per day for homes (including an allowance of 5 litres or less per person per day for external water consumption).

3. New non-residential buildings over 100sqm will be required to meet BREEAM 'Excellent' standard.

4. Proposals for change of use to residential will be required to meet BREEAM Domestic Refurbishment 'Excellent' standard (where feasible).

Reducing Carbon Dioxide Emissions

B. Developers are required to incorporate measures to improve energy conservation and efficiency as well as contributions to renewable and low carbon energy generation. Proposed developments are required to meet the following minimum reductions in carbon dioxide emissions:

1. All new major residential developments (10 units or more) should achieve zero carbon standards in line with London Plan policy.

2. All other new residential buildings should achieve a 35% reduction.

3. All non-residential buildings over 100sqm should achieve a 35% reduction. From 2019 all major non-residential buildings should achieve zero carbon standards in line with London Plan policy. Targets are expressed as a percentage improvement over the target emission rate (TER) based on Part L of the 2013 Building Regulations.

C. This should be achieved by following the Energy Hierarchy:

1. Be lean: use less energy

2. Be clean: supply energy efficiently

3. Be green: use renewable energy

Decentralised Energy Networks

D. The Council requires developments to contribute towards the Mayor of London target of 25% of heat and power to be generated through localised decentralised energy (DE) systems by 2025. The following will be required:

1. All new development will be required to connect to existing DE networks where feasible. This also applies where a DE network is planned and expected to be operational within 5 years of the development being completed.

London Borough of Richmond Upon Thames - Climate Emergency Strategy (2020)

The Strategy highlights the background to climate change and that there is a global consensus that we must take urgent action to tackle climate change before irreparable damage is done to our environment. The threat from climate change is real and will have an impact in Richmond in a number of ways including:

  - Disruption to transport and damage to infrastructure due to extreme temperatures
  - Health impacts on vulnerable residents from extreme temperatures
  - Increased flooding risk from sea/river level rise and extreme event rainfall
  - Water shortages due to drought
  - Threat to existing biodiversity in the Borough
- Work is already underway in many areas related to climate change and sustainability in

Richmond, with programmes in place to improve energy efficiency, reduce business mileage, increase recycling and capture good practice, among others.

The Climate Emergency Strategy is intended to provide an overarching framework around this issue, bringing together existing areas of work to provide more clarity and focus, to highlight linkages between approaches being taken across the organisation and to identify additional key future actions and approaches which have not previously been in place. The Strategy will focus attention on areas where we can have the most impact.

The Strategy is divided into six chapters highlighting key areas of focus:

- Our council: Becoming carbon neutral as an organisation by 2030
- Our legacy: Climate Change Mitigation and Energy Efficiency
- Our waste: Waste and Plastics and the Circular Economy
- Our air: Improving Air Quality
- Our nature: Green Infrastructure and Biodiversity

4.0 OBJECTIVES

4.1 General

The approach to gaining compliance follows the London Plan 'Energy Efficiency Hierarchy' improving the efficiency of the development before introducing low or zero carbon technologies, applying the following measures:

Be Lean	Passive design: fabric site layout, orientation, building fabric, air tightness, natural ventilation and lighting. Active design: mechanical ventilation with heat recovery, LED lighting
Be Clean	On-site generation of energy and recycling of heating/cooling through energy efficient systems i.e. CHP
Be Green	Renewable energy sources e.g. Photovoltaic panels, air source heat pump
Be Seen	Energy monitoring in occupation Report to GLA for first 5 years Demand Side Response

4.2 Development Objectives

The development objectives are summarised as follows:

- Compliance with Building Regulations Pt. L 2010 (2013 edition including 2016 amendments).
- All major developments (residential and non-residential) to meet the net-zero carbon target. This should be met with a minimum on-site 35% reduction in carbon emissions beyond Part L of 2013.
    - Residential – at least a 10% improvement on 2013 Building Regulations from energy efficiency.
- A reduction in emissions attributable to Renewables or Low Carbon Technologies.

4.3 "Be Lean" Demand Reduction

The design intent of the development is to provide buildings which will achieve significantly reduced carbon emissions by the introduction of sustainable solutions and low carbon technologies.

To achieve the target initial energy demand and CO_2 emissions reductions will be made by improving the energy efficiency of the building envelope and building services by considering the following Passive and Active design measures (as applicable to the site):

Passive Measures

- Optimising the orientation and site layout
- Natural light
- Enhancing the building fabric performance and air permeability standard
- Minimising cold bridging using accredited construction details

The passive measures are primarily driven by the architectural planning and the pre-application consultations.

Active Measures

- Communal heating system incorporating low carbon technologies and renewables.
- High efficiency plant
- Highly insulated low temperature distribution systems
- High efficiency low energy lighting
- Heat recovery ventilation
- Waste Water Heat Recovery (WWHR)
- Active controls systems (inc. variable speed pumping)

By incorporating the above principle into the development less energy will be required to maintain comfortable conditions for occupants, it will help prevent overheating in the summer and maintain temperatures in winter.

Under this stage of the GLA Spreadsheet, heating and hot water is considered purely by the use of gas fired boilers.

4.4 "Be Clean" Heating Infrastructure including CHP

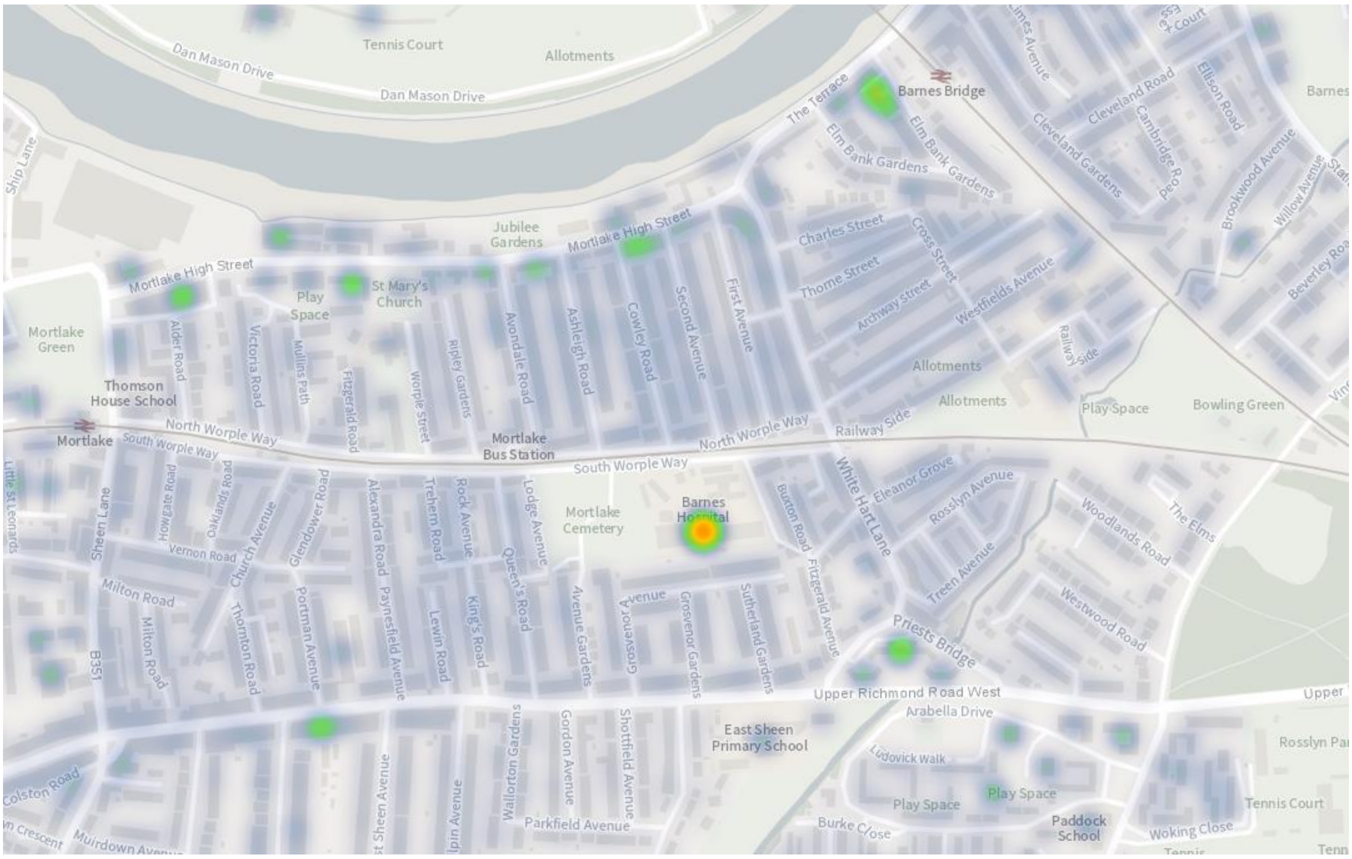
General

With the development energy demand minimised, the design approach would be to consider reducing the carbon dioxide emissions through the supply of efficient heat and electricity delivered by either a District Energy Network (DEN) or from an Energy Centre on site incorporating (CHP) and boiler plant.

This Development

MAYOR OF LONDON Heat Map

The London heat map has been checked to determine if there are any local district heating networks that could provide the heat to this development either now or in the near future. The image below is taken from the London Heat Map and shows that there are no local connection points available at this time.



Barnes Hospital Site – Local Heat Networks.

As heat networks expand in and around London all new buildings should have the ability to easily connect and make use of the efficiencies provided by large scale heat networks, therefore this development shall be provided with isolated connection points at the base of the riser in block A at high level in the carpark. In addition to these with capped off sleeves are to be provided through the surrounding foundation to allow the future pipes to enter the building.

Having ruled out initial connection to a local heat network, an option study has been undertaken into the preferred method of providing heating and water, balancing energy and emission requirements against capital and running costs. There is also a consideration to make the buildings 'zero carbon' enabled with no burning of fossil fuels on site and allowing the building to have lower emissions associated with it as the electrical grid becomes greener.

For the above reasons combined heat and power plant have been excluded.

The ongoing decarbonisation of the UKs electricity grid means that the all-electric solution will benefit the building over its life as the grid emissions reduce to net zero carbon in 2050. In this context net zero means any emissions would be balanced by schemes to offset an equivalent amount of greenhouse gases from the atmosphere, such as planting trees or using technology like carbon capture and storage.

The outcome of the study identified the preferred form of heating is via underfloor heating and or radiators fed from a central communal ASHP plant. Reasons for this include;

1. The building heating demand has been minimised.
2. Simple heating system to install, maintain, replace, and recycle.
3. Heating system has low embodied carbon.
4. Ability to integrate intelligent controllers to minimise heating energy usage.
5. Hot water is the most significant energy demand and is addressed through the heat pumps providing an element of renewable heat.
6. Waste Water Heat Recovery to reduce energy demand heating water for showering.

As no CHP is proposed the 'Be Clean' stage results within the GLA worksheet is identical to that of the 'Be Lean' stage.

4.5 "Be Green" Low and Zero Carbon Technologies

Following the review of energy demand reduction and efficient energy supply, the use of low or zero carbon technologies is considered. This is discussed in detail in section 5.0.

The principal form of low carbon heating for the development is the use of central plant Air Source Heat Pumps, located in a compound on the roof of Block A.

To enable the renewable aspect of the ASHP, providing thermal energy for both heating and domestic hot water, to be quantified and reported in the GLA tables the GLA advised that it should be included within the 'Be Green' stage of the GLA spreadsheet.

4.6 "Be Seen" – Monitoring

This step of the Energy Hierarchy, as proposed under Policy SI 2A of the London Plan 2021, requires new developments to monitor, verify and report on energy performance. The strategy for energy monitoring at the proposed development is outlined below:

Energy monitoring shall be provided within the central plant BMS and tenants HIU's as listed below. This shall allow detailed information for the plant operation and energy data to be logged and collated and used to inform the management and efficient operation of the installation.

Apartments shall be billed on the actual metered energy from the HIU's and standing charge.

Monitoring will be in accordance with the requirement laid out in the GLA Energy Monitoring Guidance (April 2020). For example, a commitment to monitor operational performance for 5 years post completion and to upload this data to an online portal (when available).

Metering provisions shall include:

a) Heat meter on feed to each building and each main heating riser
b) Heat meter on ASHPs
c) Heat meter in each apartment HIU
d) Electric Meter (to each Unit, Building and apartment)
e) Electric plant distribution panels
f) Electric ASHP check meter
g) Electric Landlords supplies (lighting and power)
h) Water Meter (landlords supplies)
i) Water Meter (apartment supplies)

4.7 Communal Energy Network Strategy

The following provides an outline of the communal heating strategy proposed for the Site, serving each of the Residential Blocks, from a centralised plant.

The Centralised plant will be located on the roof of Block A which is located furthest away from existing buildings surrounding the site. A roof top location is preferable due to the requirement for access to free air. Acoustic attenuation will be provided to ensure that noise emissions are kept below standards. This is covered further in a separate Acoustic report. The plant compound will incorporate:

- Enclosed roof plantroom with buffer vessels, pumps and associated plant.
- Open plant enclosure with Air Source Heat Pumps (ASHP).

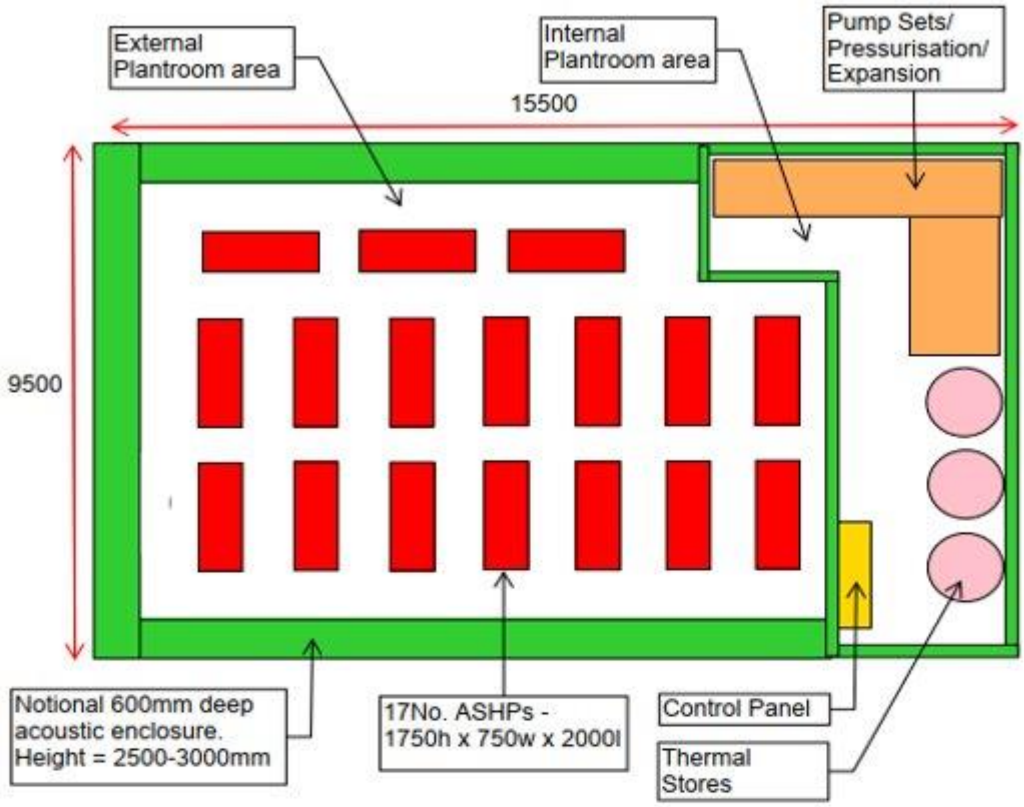


Figure 15. ASHP Enclosure

The Communal ASHP plant shall serve a primary heat distribution system of highly insulated secondary heating pipework shall distribute heat through the building, the arrangement shall minimise lateral pipework runs where possible to prevent overheating of corridors.

The Communal Heating System will be designed in accordance with CIBSE CP.1 Heat Networks; Code of Practice for the UK as the projects progresses through future design stages to operate at reduced temperatures compared to traditional systems, this approach will minimise system heat losses and maximise the network and ASHP efficiency.

Heat Interface Units (HIU's) will be provided within each Apartment to provide the apartment with heating and hot water.

4.8 Apartment Services Strategy

The Apartment services strategy is summarised as follows;

4.8.1 Heating & Hot Water

A heat interface unit (HIU) shall be provided within a utility/services cupboard. The HIU shall be wall mounted and incorporate heat meters, pump, expansion vessel, twin heat exchangers and controls.

The HIU shall utilise a plate heat exchanger to generate tertiary LTHW at 45°C flow / 35°C return to serve an underfloor heating (UFH) system. These temperatures would typically be suitable for a range of floor coverings whilst providing sufficient heat output to meet the space heating loads.

The tertiary heating circuit shall serve a UFH manifold at low level to serve the underfloor heat distribution pipework. Programmable room, time and temperature, controllers shall be provided for each circuit / room served by the UFH manifold.

A second plate heat exchanger shall generate domestic hot water (DHW) to achieve 45°C at the outlet within one minute, rising to 50°C. The DHW heat exchanger shall be sized such that the return temperature is no greater than 20°C at design condition.

Waste Water Heat Recovery (WWHR) is included to collect heat from waste water from baths and showers. The diagram below illustrates this installation. It preheats the incoming cold water feed into the shower mixer from a heat exchange mechanism within the WWHR waste pipe from the shower. It is a simple maintenance free system.

Figure 16 – Waste Water Heat Recovery (WWHR)

4.8.2 Cooling

No Cooling is proposed for any of the apartments. A separate TM59 overheating analysis and report has been carried out which determined that all apartments pass the DSY1 analysis.

4.8.3 Ventilation

All apartments shall be served by centralised mechanical supply and extract ventilation system with heat recovery (MVHR, Type 4) shall be provided. The MVHR Unit shall be wall mounted within the services / utility cupboard. The atmospheric side ductwork shall be insulated, room side ductwork shall be uninsulated and serve supply and extract intake valves.

4.8.4 Water Services

The incoming water main will enter the apartment and be routed to the service cupboard where the apartment isolation valve shall be provided. From this location the water main will serve the HIU and cold-water installation with insulated pipework routed through ceiling voids to drops to serve outlets.

The water meter for the apartment will be located within a service riser cupboard off the communal corridor serving the apartment.

In accordance with National water Standards, WC's, taps, showers and white goods will be selected to ensure compliance with Building Regulations Pt. G2 - Optional 2.8 and the conservation of water and energy. i.e., 110 l/person/day including 5 l/p/d for external use. Water use Calculators are included within Appendix B to demonstrate maximum water usage/flow rates to meet this criteria.

Landscaping and planting included as part of the development will be maintained through annual rainfall.

Separate FRA and SUDS reports address on site surface water drainage and retention.

4.8.5 Electrical Services

The electrical supply will enter the apartment and be routed to the service cupboard where the apartment consumer unit will be located. From this location the consumer unit will serve power and lighting circuits.

The electric meter for the apartment will be located within a service cupboard in the apartment.

Lighting will be incorporate 100% LED lamps within the installations.

5.0 LOW AND ZERO CARBON TECHNOLOGIES / RENEWABLES

5.1 Renewable Energy Technologies

The following summarises a review of the renewable energy technologies available and if they are appropriate for use on this development meeting site spatial and system integration requirements.

Technology	Feasible	System & Viability
Solar Thermal	**Yes**	Solar thermal collectors use the suns energy to generate domestic hot water. This option has been discounted for the following reasons: • Comparatively it would not generate enough emissions savings compared to other technologies. • It would limit roof space for more effective technologies i.e. PV which can provided energy to the hot water, heating and cooling systems. • It would limit roof space for green / brown roofs.

Technology	Feasible	System & Viability
Photovoltaics	**Yes**	PV panels generate electricity from solar energy, which can be used on site or exported to achieve an income from the UK governments new Smart Export Guarantee (SEG) that has replaced the 'Feed in tariff' scheme. PV panels are relatively simple to install, requiring little maintenance and can easily be integrated into the electrical distribution system to provide electricity for the site or it may be exported if no demand exists The connection to a communal heating system containing an ASHP energy efficient system is prioritised in the energy hierarchy over renewables. PV can be installed to not only provide electricity to landlords lighting and power installations within the residential blocks but also to serve the DHW buffer vessels when demand for the electricity is low and providing stored energy. **This option has been discounted for the following reasons:** • The use of air source heat pumps being an energy efficient system is prioritised in the energy hierarchy over renewables and the benefits exceed the planning targets. • It would limit roof space for green / brown roofs.
Wind turbine	**No**	The use of wind turbines has been discounted for the following reasons: • Limitations in quantity of energy that could be reliably generated. • Insufficient space to locate a freestanding wind turbine within the site boundary. • Building height restrictions whilst meeting building planning and aesthetic requirements.

Technology	Feasible	System & Viability
Biomass boiler	**No**	The use of biomass boilers has been discounted for the following reasons: • No wet heating system is proposed for the development.
Ground Source Heat Pump (GSHP)	**No**	The use of GSHP's have been discounted for the following reasons: • Insufficient space is available within the site boundary for the location of ground piles or earth loops to extract heat.
Water Source Heat Pump (WSHP)	**No**	The use of WSHP's have been discounted for the following reasons: • No water course is readily available within or adjacent to the site boundary to extract heat. • The use of open bore holes is not considered cost effective compared to other technologies.
Air Source Heat Pump (ASHP) – Space Heating & Domestic Hot Water	**Yes**	The use of ASHP's to provide heat for both space heating and/or domestic hot water has been considered for the following reasons: They operate most efficiently at lower temperatures making them suitable for the generation of the primary heating medium and hot water. They are electrically powered systems, which means no localized air quality concerns. They benefit from the new SAP10 carbon factors which makes them an efficient and low carbon technology. This system has been deemed as a viable solution as CHP plant is not proposed in accordance with GLA guidance. The ASHP provides a renewable heat contribution and is compatible with the proposed Communal Heating System. Hence this option is proposed.

Technology	Feasible	System & Viability
Air Source Heat Pump - Variable Refrigerant Flow - Heating & Cooling (VRF ASHP)	**No**	Air source heat pumps provide space heating and cooling in a highly efficient manner. Instead of using water to transport the heat/coolth extracted from the air, a VRF ASHP system uses a refrigerant gas as the transport medium to either the branch control unit or terminal unit. They are able to transfer heat from one area of a building to another where different demands may be required hence significantly improving the installations efficiency. ASHP systems are a proven, efficient and well understood technology. **With sleeping accommodation VRF systems utilising refrigerant gas are a potential hazard due to leakage. As no Cooling is proposed for this site a water based system is preferred to overcome this issue. This option has therefore been discounted.**

5.2 Air Source Heat Pump (ASHP) – Air to Water

An air source heat pump (ASHP) works by transferring heat absorbed from the outside air to an indoor space, such as a home or an office via a wet heating systems to under floor heating and to provide domestic hot water.

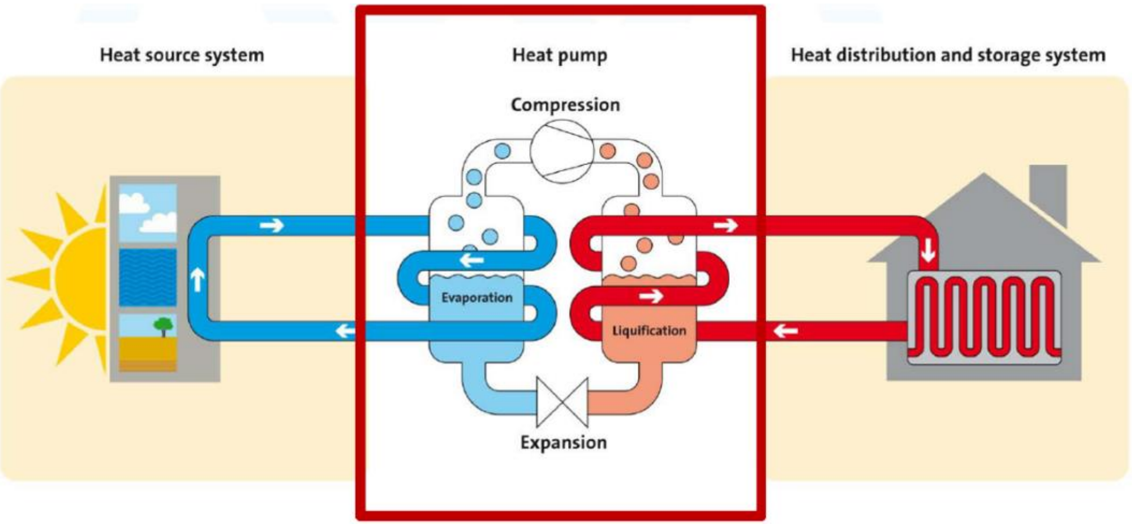


Figure 17. Heat Pump Cycle

An ASHP works a bit like a refrigerator in reverse. The process consists of an evaporator, a compressor and a condenser. The ASHP absorbs heat from the outside air into a liquid at a low temperature, then the heat pump compressor increases the temperature of that heat. In the condenser, the hot liquid's heat is transferred to the heating circuits.

It is important to note that air at a temperature above absolute zero always contains some heat and heat pumps can extract useful heat even at temperatures low as -15 C degrees.

6.0 BUILDING COMPLIANCE

6.1 SAP 2012 and SAP 10

In order to assess the energy and CO_2 emissions for the development, the building geometry, building fabric thermal properties and building services systems options have been entered into Elmhurst Energy Systems Ltd 2012 SAP Software v4.14r17, the latest version available at the time and featuring Building Regulations Compliance Part L1 2013 & SAP2012. This data has been subsequently extracted and entered into the GLA Carbon Emission Reporting Spreadsheet v1.1 and the corresponding SAP 10 data this GLA spreadsheets for both domestic compliance calculations. Currently, the compliance tools, domestic or non-domestic, do not utilise the SAP10 carbon factors and the required tool to extrapolate emissions using these revised factors, is the GLA Spreadsheet.

6.2 SAP 2012 – Baseline Calculation

The initial 'baseline' SAP assessment was undertaken using a communal heating system served by gas fired boilers only. Its purpose is to establish a benchmark Building Regulations compliant model whereby the TFEE/DFEE test is met and the full benefit of the ASHP plant introduction to the centralised energy system may be more easily determined and extracted to illustrate its contribution to the overall emissions reductions.

6.3 Design Criteria

The SAP 2012 energy modelling is been based on the following criteria:

1.	Primary Heating –	Communal ASHP
2.	Hot Water –	Communal ASHP
3.	Ventilation –	Type 4
4.	Thermal Bridging -	Accredited Construction Details
5.	Lighting Efficacy –	100% Low Energy Lighting
6.	U Values -	As table below
7.	Air Permeability -	As table below

The table below provides a comparison of the U-value standards required by the Building Regulations Part L1A 2013 with 2016 Amendments, the notional values used in the compliance tools and the proposed U-values used for the basis of the calculations in this report.

Building Fabric	2013 Building Regs Maximum U-Values	2013 Notional Building U-Values	Proposed U-Values
Windows	2.20 W/m² °K	1.60 W/m² °K g-value = 0.40	1.40 W/m² °K g-value = 0.43
External Walls	0.35 W/m² °K	0.26 W/m² °K	0.15 W/m² °K
Ground Floor	0.25 W/m² °K	0.22 W/m² °K	0.12 W/m² °K
Roof	0.25 W/m² °K	0.18 W/m² °K	0.12 W/m² °K
Personnel Doors	2.20 W/m² °K	2.20 W/m² °K	2.00 W/m² °K
Infiltration	**2013 Building Regs Target**	**2013 Notional Building**	**Proposed**
Air Tightness	10.0 m³/h/m² @ 50Pa	3.0 m³/h/m² @ 50Pa	3.0 m³/h/m² @ 50Pa

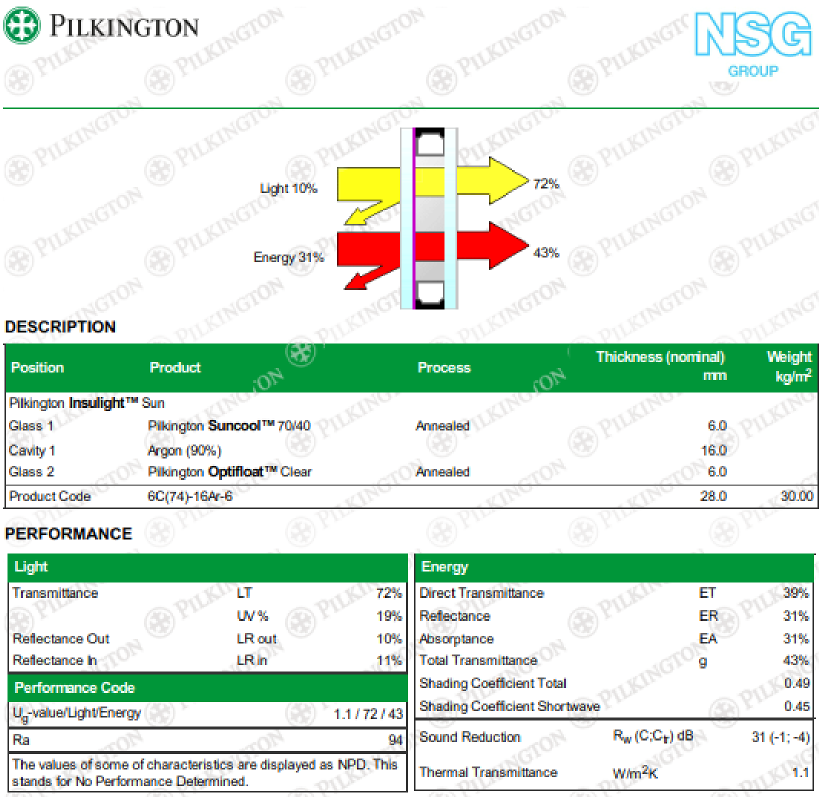
Figure 38. Fabric Thermal Properties

Mechanical Ventilation Heat Recovery – Minimum 73% efficiency

The specifications of glazing modelled:

- Pilkington 70/40 g value = 0.43 Colour/Tint = Clear/Neutral

The g value being the proportion of solar gain that enters the space through the glazing.



PILKINGTON

NSG GROUP

Light 10%

72%

Energy 31%

43%

DESCRIPTION

Position	Product	Process	Thickness (nominal) mm	Weight kg/m²
Pilkington **Insulight™** Sun				
Glass 1	Pilkington **Suncool™** 70/40	Annealed	6.0	
Cavity 1	Argon (90%)		16.0	
Glass 2	Pilkington **Optifloat™** Clear	Annealed	6.0	
Product Code	6C(74)-16Ar-6		28.0	30.00

PERFORMANCE

Light		
Transmittance	LT	72%
	UV %	19%
Reflectance Out	LR out	10%
Reflectance In	LR in	11%
Performance Code		
U_g-value/Light/Energy		1.1 / 72 / 43
Ra		94

The values of some of characteristics are displayed as NPD. This stands for No Performance Determined.

Energy		
Direct Transmittance	ET	39%
Reflectance	ER	31%
Absorptance	EA	31%
Total Transmittance	g	43%
Shading Coefficient Total		0.49
Shading Coefficient Shortwave		0.45
Sound Reduction	R_w (C;C_{tr}) dB	31 (-1; -4)
Thermal Transmittance	W/m²K	1.1

Figure 19. Suncool 70/40

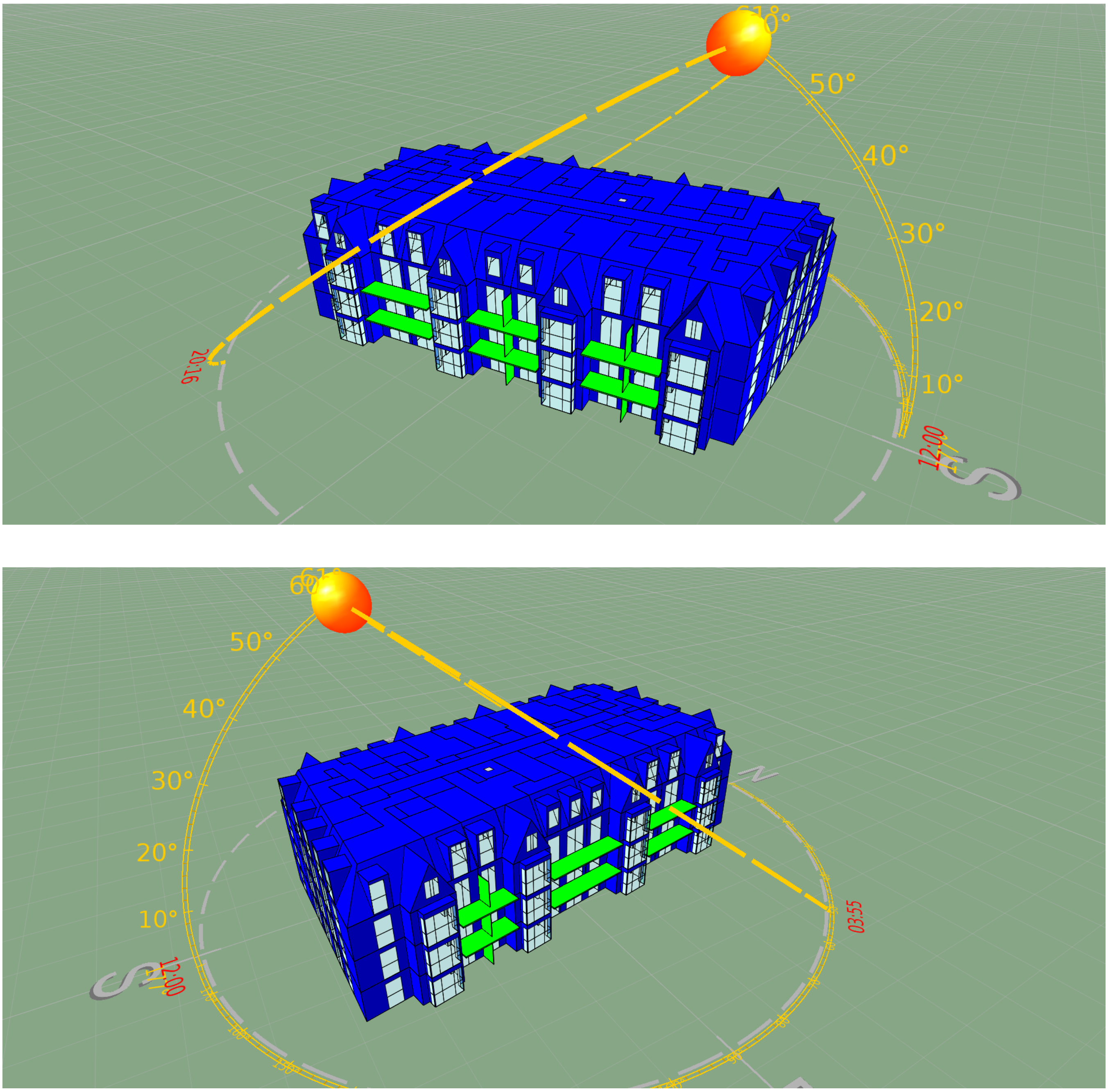


Figure 4. IES-VE DSM Thermal Model Images

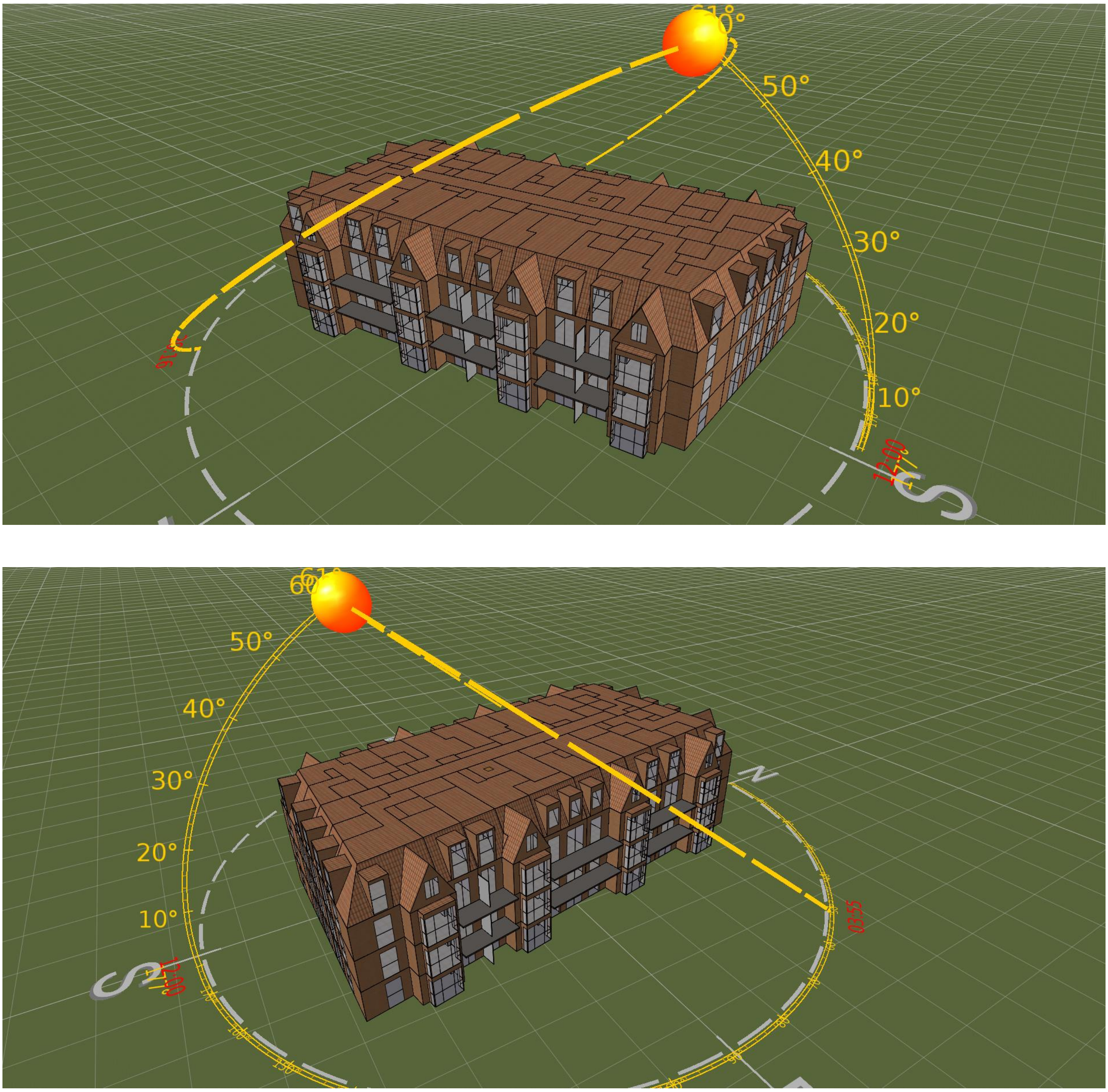


Figure 21. IES-VE Thermal Model Image

7.0 GLA RESULTS TABLES

The results of the SAP calculations have been entered into the GLA Spreadsheet v1.2 2020.

Although the development is non-referrable to the GLA, the SAP 10.0 figures generated by the GLA Worksheet v1.2 required for referrable schemes, is also provided for information purposes. SAP 10.0 is a draft document and will, along with its revised carbon factors, be integrated into the new Part L. Providing this information will allow a comparison to be made against the new Part L during this interim period.

‘Be Lean’ Improvement

In order to clarify the ‘Be Lean’ improvement using Building Regulations 2010 emission factors, the following table summarises the emission reductions required against the emission reductions achieved.

The table below shows the ‘Be Lean’ Stage results for the ASHP. It includes all the energy efficient systems, such as MVHR, LED lighting, controls etc and efficient thermal fabric.

The results demonstrate the site exceeds the required 10% domestic ‘Be Lean’ requirements with boilers.

	Requirement	Baseline	Be Lean (ASHP No PV)	Be Lean Improvement
	%	$kgCO_2/m^2$	$kgCO_2/m^2$	%
Site Wide	10	16.78	14.88	**11.3%**

Figure 22. ‘Be Lean’ Results Summary

7.1 Site Wide – SAP2012

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	21.8	38.9
After energy demand reduction (be lean)	19.3	38.9
After heat network connection (be clean)	19.3	38.9
After renewable energy (be green)	14.0	38.9

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	2.5	11%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	5.3	24%
Cumulative onsite savings	7.8	**36%**
Annual savings from off-set payment	14.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	419	-
Cash in-lieu contribution (£)	**39,830**	

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

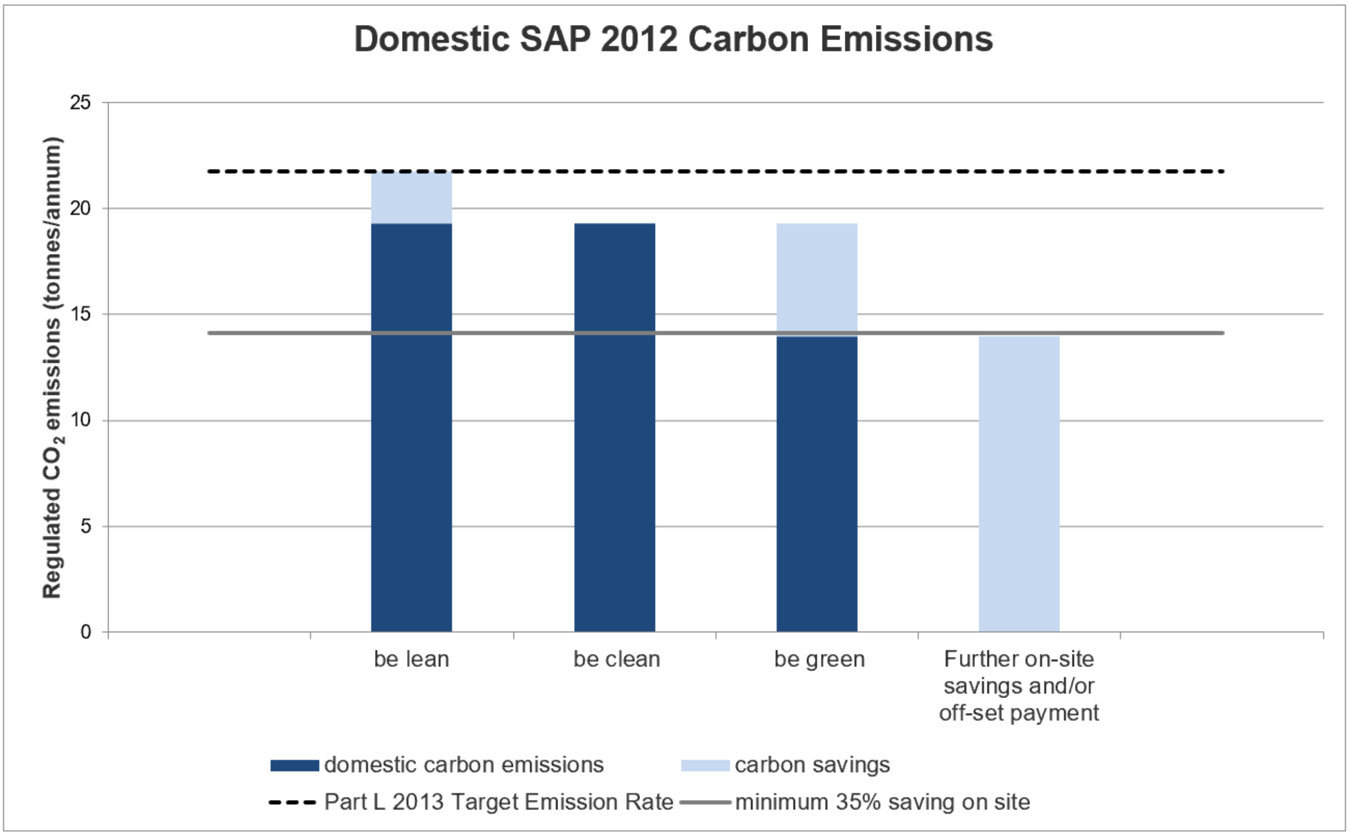
	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.0	**0%**
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Total Cumulative Savings	0.0	**0%**
Annual savings from off-set payment	0.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**0**	-
Cash in-lieu contribution (£)	**0**	

Table 5: Carbon Dioxide Emissions – SITE WIDE

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2013 baseline	21.8		
Be lean	19.3	2.5	**11%**
Be clean	19.3	0.0	0%
Be green	14.0	5.3	24%
Total Savings	-	7.8	**36%**
	-	CO2 savings off-set (Tonnes CO2)	-
Off-set	-	**419.3**	-



7.2 Site Wide – SAP10

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development	19.1	17.5
After energy demand reduction (be lean)	16.4	17.5
After heat network connection (be clean)	16.4	17.5
After renewable energy (be green)	6.3	17.5

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: Savings from energy demand reduction	2.7	14%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	10.1	53%
Cumulative on site savings	12.9	**67%**
Annual savings from off-set payment	6.3	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	188	-
Cash in-lieu contribution (£)	**17,881**	

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

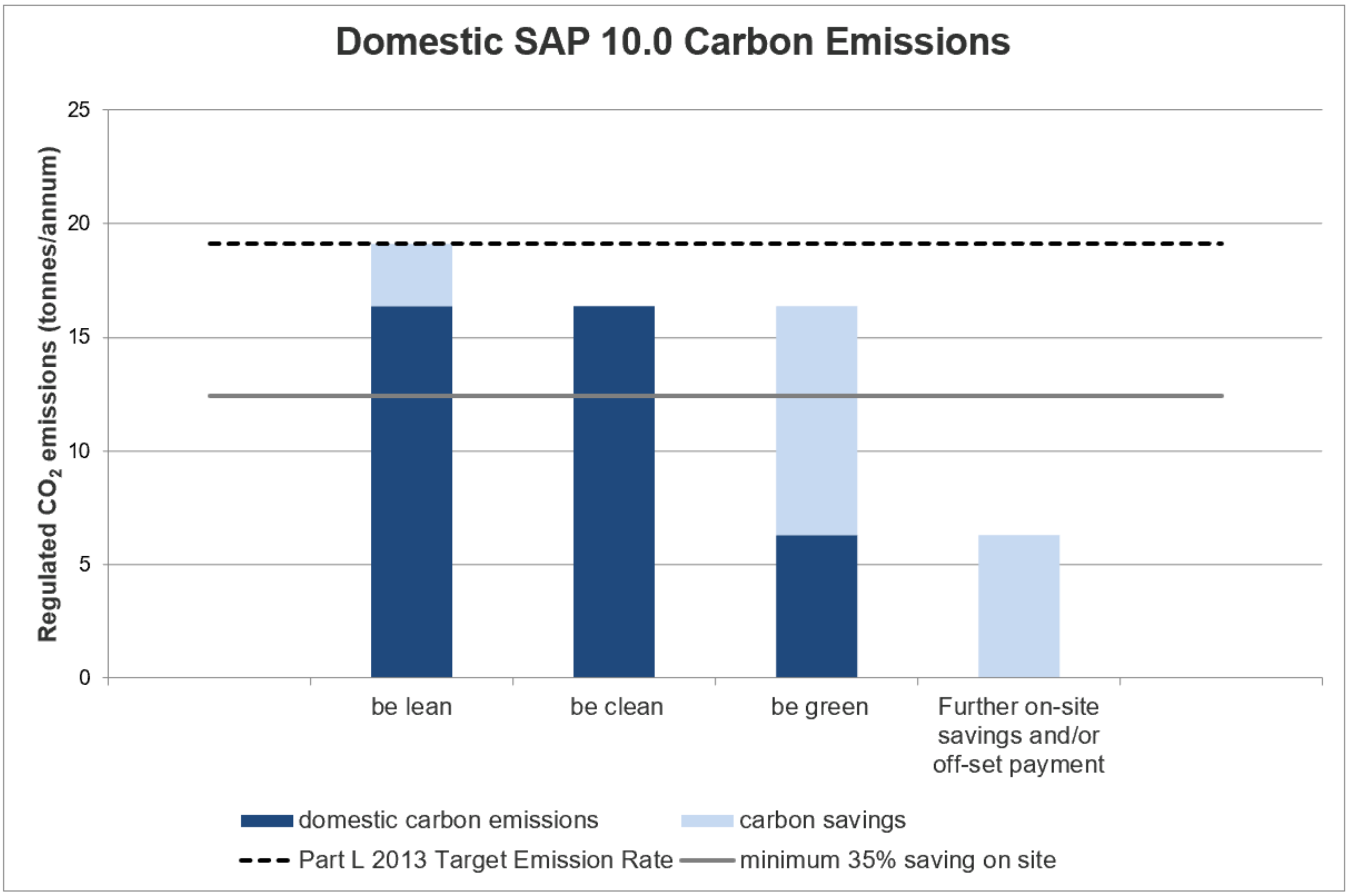
	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: savings from energy demand reduction	0.0	**0%**
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Total Cumulative Savings	0.0	**0%**
Annual savings from off-set payment	0.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**0**	-
Cash in-lieu contribution (£)*	**0**	

Table 5: Carbon Dioxide Emissions – SITE WIDE

	Total regulated emissions (Tonnes CO_2 / year)	**CO_2 savings (Tonnes CO_2 / year)**	**Percentage savings (%)**
Part L 2013 baseline	19.1		
Be lean	16.4	2.7	**14%**
Be clean	16.4	0.0	0%
Be green	6.3	10.1	53%
Total Savings	-	12.9	**67%**
	-	CO2 savings off-set (Tonnes CO2)	-
Off-set	-	**188.2**	-



8.0 GLA CARBON OFFSET PAYMENT

	Carbon Offset Payment (£)
TOTAL Site Wide	**£39,830**

9.0 COOLING AND OVERHEATING

9.1 Cooling Hierarchy

To reduce the impact of the urban heat island effect in London and encourage the design of places and spaces to avoid overheating and excessive heat generation, and to reduce overheating due to the impacts of climate change and the urban heat island effect on an area wide basis the proposals reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy in line with London Plan Policy Si 4:

1. Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure.
2. Minimise internal heat generation through energy efficient design.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings:
4. Provide passive ventilation:
5. Provide mechanical ventilation:
6. Provide active cooling systems:

Discussions have been held to take into consideration the hierarchy in relation to building(s) as follows:

1. High levels of insulation to minimise the ingress of heat via external conduction
2. Solar control glazing to limit direct and diffuse solar radiation entering the building
3. Glazing area proposed balancing control of solar gains and maintaining good daylighting
4. Passive ventilation provided via openable windows.
5. Mechanical ventilation with heat recovery

9.2 Overheating Risk Analysis

All developments are required to undertake an analysis of the risk of overheating. Building Regulations requirements are set out in Table 10, and these should be carried out at Stage 1.

Domestic Developments	Non-Domestic Developments
Pre-Application Stage	
Complete the Good Homes Alliance (GHA) Early Stage Overheating Risk Tool and submit it to the GLA as part of the preliminary energy information for the development. More information on the GHA tool can be found in Appendix 1.	Outline in the preliminary strategy information submitted to the GLA how the overheating risk will be minimised.
Stage 1	
Include the GHA Early Stage Overheating Risk Tool in the energy assessment.	N/A
Undertake dynamic overheating modelling in line with the guidance and data sets in CIBSE TM59 and TM49 respectively	Undertake dynamic overheating modelling in line with the guidance and data sets in CIBSE TM52 and TM49 respectively
Provide evidence of how the development performs against the overheating criteria along with an outline of the assumptions made in the energy assessment.	
Stage 2	
Ensure that the results of the overheating analysis continue to be incorporated into the building design discussions as the design evolves. Any substantive changes from Stage 1 proposal will require revised overheating analysis.	

Figure 23. GLA Table 10 – Building Regulation Overheating Requirements

As required by the GLA Energy Statement Guidance document the following assumptions have been used within the thermal modelling and overheating assessments:

Design Assumptions	
Dynamic overheating analysis software used.	The thermal modelling has been undertaken using IES-VE 2021.0.2.0 with VE Compliance v7.0.13 software.
Site location	Worple Way. London Borough of Richmond Upon Thames
Site orientation	Facades face W/E/N & S Refer to plans in Section 2.
Weather file used	Thermal Modelling: London DSY weather file TM52 Overheating Analysis: London 2020 DSY1 High percentile 50% weather file
Internal gains	As per NCM templates, refer to Appendix A.
Occupancy profiles	As per NCM templates, refer to Appendix A.
Thermal elements performance (U-values and glazing g-values)	Refer to Fig.14 in Section 6.2 and Fig.16 in Section 7.2.
Shading features (i.e. blinds, overhangs etc.)	Solar Control glazing, deep window recesses, inset balconies.
Thermal mass details	Light/Medium weight Construction
Ventilation strategy	Natural Purge ventilation Background ventilation to ADF Type 4.
Model images indicating the sample units modelled	Plan layouts modelled are as images in Section 2.
Units' internal layout	Refer to plans in Section 2.

Figure 24. Design Assumptions

9.3 SAP2012 Overheating

Balconies with full height glazing are provided to each property, and the windows have deep recesses that provide a degree of shading reducing solar gains.

APARTMENT TYPE	MULTIPLIER	GLAZING TYPE	RISK
A.01.01	1	Suncool 70/40 g=0.43	Not significant
A.01.02	1	Suncool 70/40 g=0.43	Not significant
A.01.07	2	Suncool 70/40 g=0.43	Not significant
A.01.04	1	Suncool 70/40 g=0.43	Not significant
A.02.07	2	Suncool 70/40 g=0.43	Not significant

Figure 25. Domestic Overheating Risk – Block A

APARTMENT TYPE	MULTIPLIER	GLAZING TYPE	RISK
B.01.05	1	Suncool 70/40 g=0.43	Not significant
B.01.06	1	Suncool 70/40 g=0.43	Not significant
B.01.07	1	Suncool 70/40 g=0.43	Not significant
B.01.04	1	Suncool 70/40 g=0.43	Not significant
B.03.07	1	Suncool 70/40 g=0.43	Not significant
B.01.08	1	Suncool 70/40 g=0.43	Not significant
B.03.08	1	Suncool 70/40 g=0.43	Not significant

Figure 26. Domestic Overheating Risk – Block B

APARTMENT TYPE	MULTIPLIER	GLAZING TYPE	RISK
C.01.05	1	Suncool 70/40 g=0.43	Not significant
C.01.07	1	Suncool 70/40 g=0.43	Not significant
C.01.08	1	Suncool 70/40 g=0.43	Not significant
C.01.10	1	Suncool 70/40 g=0.43	Not significant
C.03.08	1	Suncool 70/40 g=0.43	Not significant

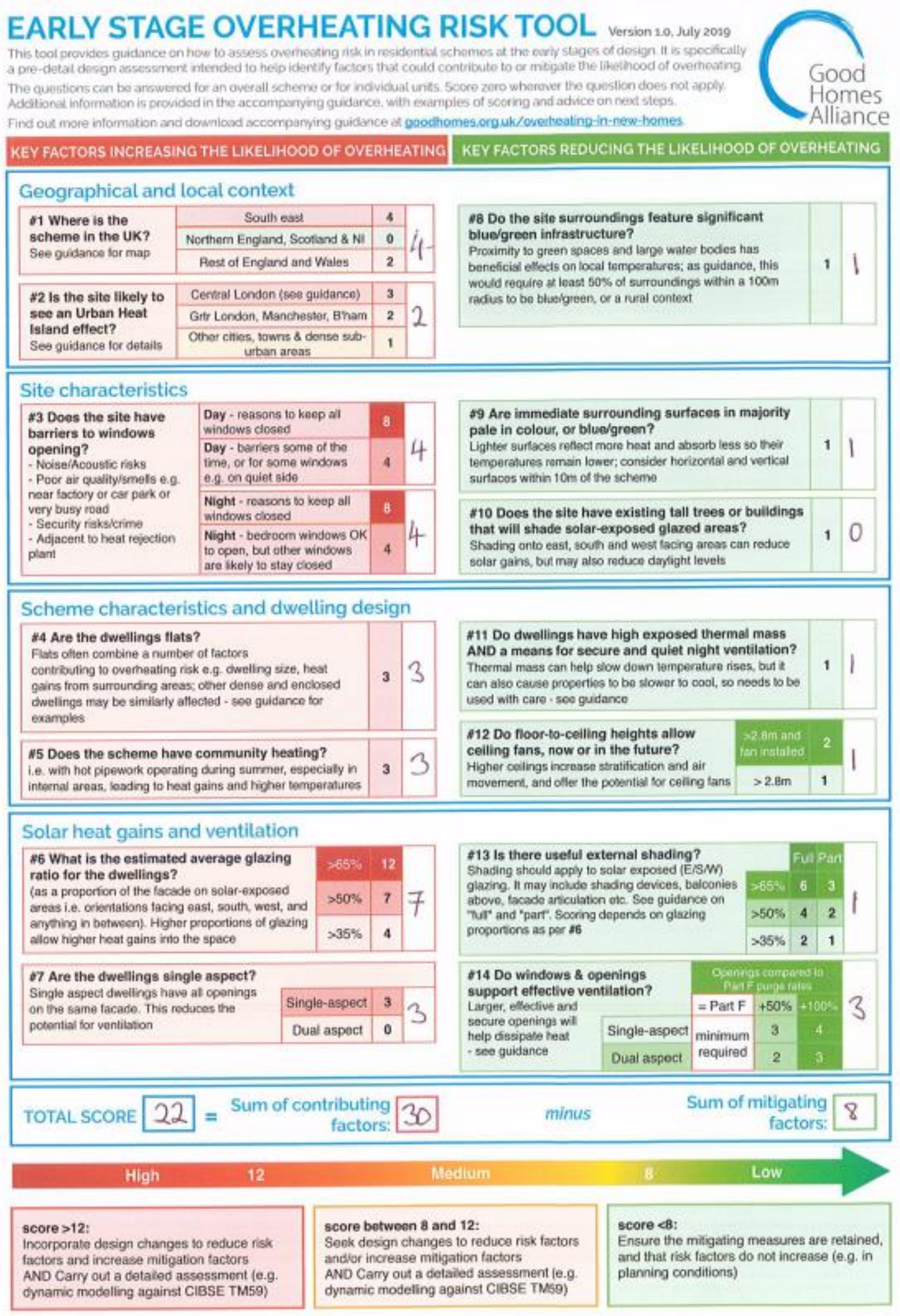
Figure 27. Domestic Overheating Risk – Block C

The use of solar control glazing is proposed to minimise solar gains. The SAP overheating analysis clearly indicates that with the windows 'fully open' the overheating risk is 'not significant'.

To analyse the overheating risk more accurately, a TM:59 Overheating Analysis has been undertaken. This is provided within a separate report. However, the findings have been summarised in Section 9.5.

9.4 Domestic Early Stage Overheating Tool

The following tables are from the Energy Assessment Guidance (April 2020) and its corresponding associated GHA Overheating in New Homes (July 2019) document.



EARLY STAGE OVERHEATING RISK TOOL

Version 1.0, July 2019

This tool provides guidance on how to assess overheating risk in residential schemes at the early stages of design. It is specifically a pre-detail design assessment intended to help identify factors that could contribute to or mitigate the likelihood of overheating.

The questions can be answered for an overall scheme or for individual units. Score zero wherever the question does not apply. Additional information is provided in the accompanying guidance, with examples of scoring and advice on next steps.

Find out more information and download accompanying guidance at goodhomes.org.uk/overheating-in-new-homes

Good Homes Alliance

KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING

KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING

Geographical and local context

#1 Where is the scheme in the UK? See guidance for map	South east	4	4
	Northern England, Scotland & NI	0	
	Rest of England and Wales	2	
#2 Is the site likely to see an Urban Heat Island effect? See guidance for details	Central London (see guidance)	3	2
	Grtr London, Manchester, B'ham	2	
	Other cities, towns & dense sub-urban areas	1	

#8 Do the site surroundings feature significant blue/green infrastructure? Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context	1	1

Site characteristics

#3 Does the site have barriers to windows opening? - Noise/Acoustic risks - Poor air quality/smells e.g. near factory or car park or very busy road - Security risks/crime - Adjacent to heat rejection plant	**Day** - reasons to keep all windows closed	8	4
	Day - barriers some of the time, or for some windows e.g. on quiet side	4	
	Night - reasons to keep all windows closed	8	4
	Night - bedroom windows OK to open, but other windows are likely to stay closed	4	

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme	1	1
#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas? Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels	1	0

Scheme characteristics and dwelling design

#4 Are the dwellings flats? Flats often combine a number of factors contributing to overheating risk e.g. dwelling size, heat gains from surrounding areas; other dense and enclosed dwellings may be similarly affected - see guidance for examples	3	3
#5 Does the scheme have community heating? i.e. with hot pipework operating during summer, especially in internal areas, leading to heat gains and higher temperatures	3	3

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance		1	1
#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future? Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans	>2.8m and fan installed	2	1
	> 2.8m	1	

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings? (as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space	>65%	12	7
	>50%	7	
	>35%	4	
#7 Are the dwellings single aspect? Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation	Single-aspect	3	3
	Dual aspect	0	

		Full	Part	
#13 Is there useful external shading? Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per **#6**	>65%	6	3	1
	>50%	4	2	
	>35%	2	1	

		Openings compared to Part F purge rates			
		= Part F	+50%	+100%	
#14 Do windows & openings support effective ventilation? Larger, effective and secure openings will help dissipate heat - see guidance	Single-aspect	minimum required	3	4	3
	Dual aspect		2	3	

TOTAL SCORE 22 = Sum of contributing factors: 30 *minus* Sum of mitigating factors: 8

High 12 Medium 8 Low

score >12: Incorporate design changes to reduce risk factors and increase mitigation factors AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)	**score between 8 and 12:** Seek design changes to reduce risk factors and/or increase mitigation factors AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)	**score <8:** Ensure the mitigating measures are retained, and that risk factors do not increase (e.g. in planning conditions)

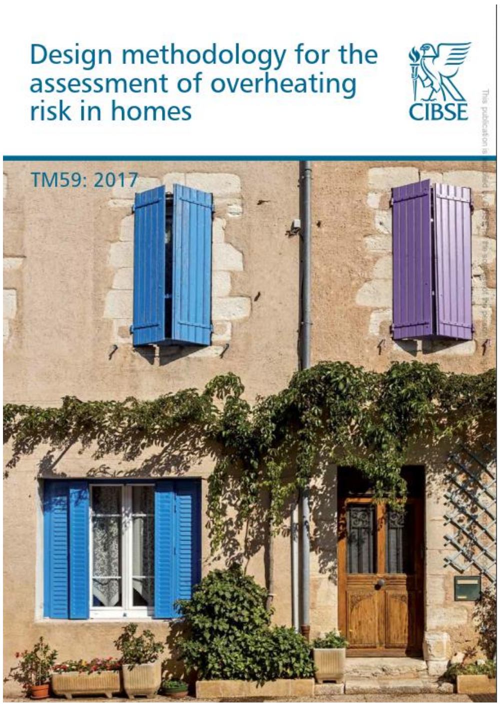
A detailed TM:59 analysis has been undertaken, this report may be found within the information accompanying this report. A summary of findings are included within this report.

9.5 TM:59 Assessment of Overheating in Homes.

In line with the GLA Energy Strategy and Part L1 et al, a TM:59 assessment of the overheating in risk in homes is required.

The purpose of the analysis is to determine if any of the apartments suffer from overheating and to identify opportunities with which to limit or alleviate any potential issues. The assessment recognises the difference usages, e.g. living rooms and bedrooms, and the time of day that these spaces are normally occupied.

The dynamic simulation modelling and the TM:59 analysis demonstrate the proposed glazing specification is acceptable and the ventilation strategy required to meet these demands.



Design methodology for the assessment of overheating risk in homes

CIBSE

TM59: 2017

The results of the analysis indicated that, following development of building design with the Architect, all dwellings and communal areas passed the overheating tests described within the CIBSE Technical Memorandums.

A separate TM:59 report has been prepared taking Block B as representative of the other blocks. A summary of its findings follows:

The glass specification considered is as follows:

- Suncool 70/40 g=0.43

This provides a modicum of solar control for summer periods whilst still allowing for passive solar gains during winter months.

Three 2020 weather files are used for the analysis, as follows:

- DSY1 – A moderately warm summer.
- DSY2 – A summer with a short intense warm spell.
- DSY3 – A summer with a long less intense warm spell.

The results for DSY2 and DSY3 are for information on the buildings performance in relation to future climate change and whilst they should be reported they are not mandatory to pass under TM:59.

Weather File	Glazing	Room	Pass / Fail
DSY1	Suncool 70/40 Glass	LKDs	**Pass**
	Suncool 70/40 Glass	Bedrooms	**Pass**
DSY2	Suncool 70/40 Glass	LKDs	**6 out of 36 Fail**
	Suncool 70/40 Glass	Bedrooms	**20 out of 71 Fail**
DSY3	Suncool 70/40 Glass	LKDs	**17 out of 36 Fail**
	Suncool 70/40 Glass	Bedrooms	**All Fail**

- LKD's must meet Criteria 1 of TM:52 and hence will comply with TM:59, Chapter 4.2, Para (a)
- Bedroom must comply with TM:59, Chapter 4.2, Para (b).

The LDK's Pass the TM59 analysis comfortably under the DSY1 file. However, both the DSY2 & DSY3 show some slight failures. Under Criterion 1, the Hours of Exceedance should not exceed 3% of the occupied hours. Under DSY2 this extends to 3.8% (worst case) of the occupied hours and under DSY3 this extends to 5.4% (worst case) of the occupied hours.

In terms of hours, Criterion 3 must be less than 60hrs per annum. The DSY2 fail shows 76hrs, an additional 16hrs per annum. DSY3 shows 108hrs, an additional 48hrs per annum.

The bedrooms all comfortably Pass the TM:59 analysis under all DSY1 weather file. Under the DSY2 weather file, the greatest exceedance is 48hrs, an additional 16hrs of the annual occupied hours. Under the DSY3 weather file, all bedrooms failed; with the greatest exceedance an additional 45hrs of the annual occupied period.

Under the more extreme DSY2 & 3 climate change heat wave scenarios, there is some risk of overheating in some apartments. However, under normal climate change forecast scenario, the apartments perform well.

These results are typical of naturally ventilated apartments. To achieve full compliance with TM59 under DSY2 & 3, comfort cooling would be required.

9.6 Communal Corridors – DSY1, DSY2 & DSY3

The methodology requires that internal communal corridors are also considered. To pass they must not exceed 28°C for 3% of the annual hours.

Under all 3 weather files the communal corridors modelled all passed TM:59.

10.0 CONCLUSION

This Energy Statement outlines how the reductions in CO_2 emissions are achieved through the use of Fabric Energy Efficiency (FEE) performance, energy efficient services, through the use of low to zero carbon technologies, and a “Be Seen” monitoring strategy, thereby demonstrating compliance with Energy Hierarchy, Building Regulations Part L 2013 and Local Authority energy polices. Note: All domestic properties have their Be Lean assessed via the Be Green due to limitations of GLA Spreadsheet v1.2 as advised by GLA.

The results of the analysis are summarised below:

<u>SAP2012</u>

- Domestic
    - 11% reduction in regulated emissions compared to Building Regulations Part L1A 2013 on energy efficiency measures alone (Be Lean)
    - An overall reduction in regulated emissions of 36%
    - 24% reduction in regulated emissions attributable to renewables (ASHP)

<u>SAP10</u>

- Domestic
    - 14% reduction in regulated emissions compared to Building Regulations Part L1A 2013 on energy efficiency measures alone (Be Lean)
    - An overall reduction in regulated emissions of 67%
    - 53% reduction in regulated emissions attributable to renewables (ASHP)

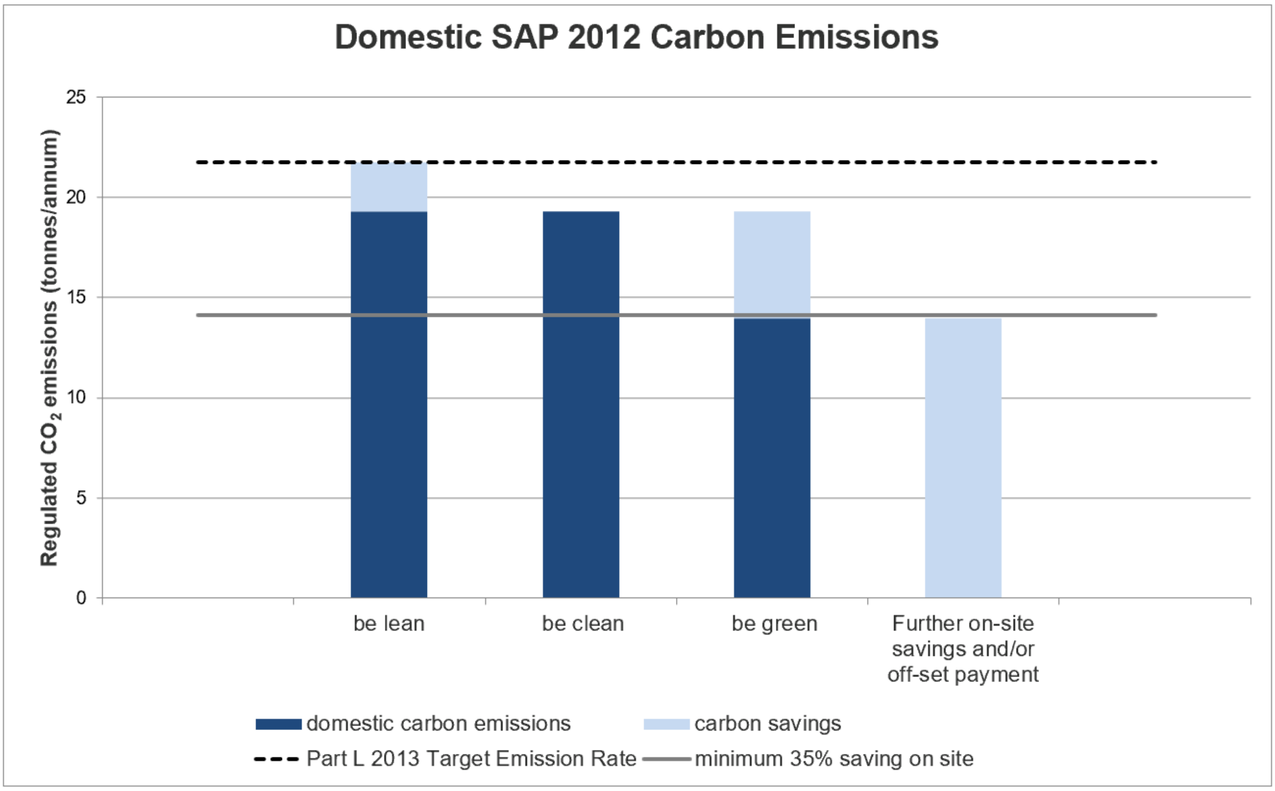


Figure 28. SAP 2012 CO_2 Emissions Reductions

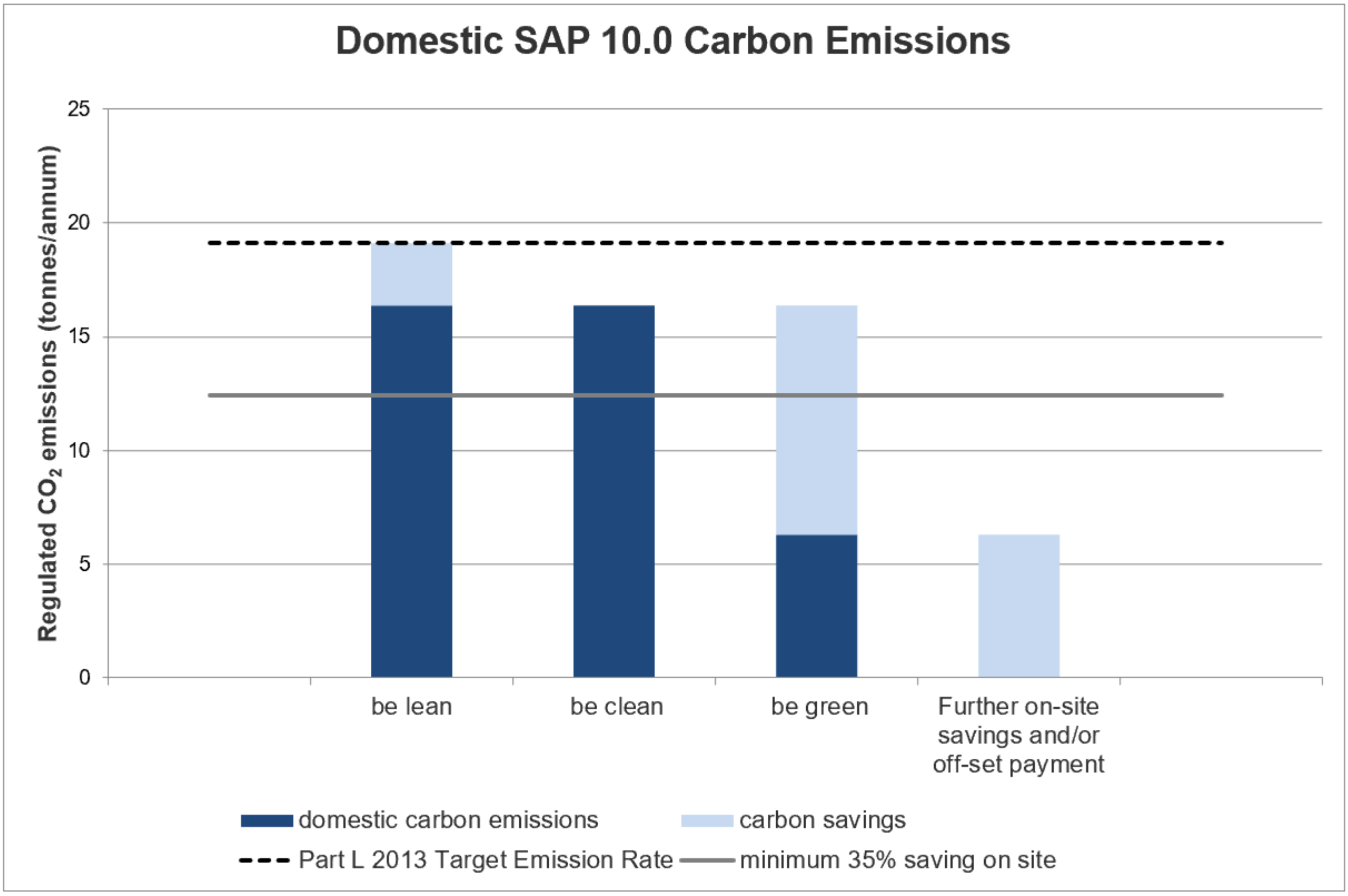


Figure 29. SAP 10.0 CO_2 Emissions Reductions

APPENDIX A

SAP COMPLIANCE DOCUMENTS