BRILL PLACE

ENERGY & SUSTAINABILITY STATEMENT

Author	Client	Project	Date
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Audit sheet.

Rev.	Date	Description	Prepared	Reviewed	Verified
01	04.11.2019	Draft issue for comment	L. Wille	M. Wang	C. Williamson
02	15.11.2019	Issued for planning amendment	L. Wille	M. Wang	C. Williamson
03	19.11.2019	Updated with client comments	L. Wille	M. Wang	C. Williamson
04	20.11.2019	Updated development description	L. Wille	M. Wang	C. Williamson

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Document reference: REP-2323397-5A-LFW-20191029-Revised Energy & Sustainability Strategy-Rev04

Contents.

Introduction.

This report has been prepared on behalf of Brill Place Limited in support of the S73 application for Brill Place, Central Somers Town, Camden. This scheme has received planning approval, however this S73 application summarises the results of the intent to amend the energy strategy of the site, to a strategy fully served from the existing Central Somers Town energy centre. This application falls under the planning jurisdiction of the London Borough of Camden.

The previous energy strategy proposed to use the district energy connection for hot water only, with heating provided from gas absorption heat pumps. It was also proposed to implement a PV array incorporated into the glazed façade of the staircase on the southern elevation of the Proposed Development.

This update proposes to simplify the strategy, to provide all heating and domestic hot water from the Somers Town Energy District Heating Network which incorporates CHP and gas fired boilers. Correspondence with Vital Energy, who operate the network on behalf of Camden, confirms that there is capacity to supply the required energy from this low carbon energy source.

This report does not represent a full viability study of all available low or zero carbon technologies applicable to the development. These details are contained in the original Energy Strategy report, submitted in the original planning application.

As such this document sets out the changes and improvements to energy efficiency on site brought about by the updated strategy, and sets out how that differs (if at all) from the previously consented scheme.

Further elements covered in the previous application ‘energy & sustainability statement’:
The consented Energy and Sustainability Statements also covered the following items:

- Water consumption
- Surface water run-off and flooding
- Materials, waste and recycling
- Ecology

No change is proposed to the above items and therefore they are not covered in this report.

Executive summary.

This report describes the revised energy strategy for approval under Section 73, following the approved full planning application submitted in 2016 (application number 2015/2704/P) for the development of a residential building at Brill Place Tower (plot 7), as part of the Central Somers Town development in the London Borough of Camden.

Development Description

'An application pursuant to s73 of the Town and Country Planning Act 1990 (as amended) to vary conditions 2 (approved drawings), 3 (approved documents), 15 (quantum of housing, plot 7) and 80 (cycle parking, plot 7) of planning permission ref. 2015/2704/P) in relation to Plot 7, Central Somers Town.'

This application regards Amendments in relation to Plot 7; including: revisions to external appearance, revisions to floorplans including residential layout and ground floor layout, including internal and external structural columns, an increase in residential unit numbers from 54 to 68 units, and revisions to the energy strategy.

Table 1: Area schedule.

Space Type	Space Use	Floor Area
Domestic (C3):	68 apartments	4,501 m^2 (NSA)
Non-domestic:	Flexible retail units (A1-A4)	60 m^2 (NIA)
	Residential lobby	72 m^2 (NIA)

Consented site-wide energy strategy

The consented scheme proposed an energy strategy in line with the energy hierarchy Be Lean, Be Clean, Be Green as follows:

- Be Lean: Use of energy efficiency measures to achieve 7.9% improvements over a baseline (Part L 2013). Attention was given to achieving a building fabric energy efficiency in line with Camden targets
- Be Clean: Connecting to the district heating scheme with combined heat and power (CHP) technology. To supply all hot water to the building, resulting in a further carbon emission reduction of 14.9% over the baseline.
- Be Green: Gas Absorption Heat Pump (GAHP) was proposed to provide all of the space heating, and integrated Photovoltaics (PVs) to provide a proportion of the electricity for the development. This was estimated to result in further carbon emission reductions of 17.2% (combined for the two systems).

Total carbon emission reductions of 40% were therefore expected, resulting from the approach set out above.

Revised site-wide energy strategy

Since the original planning application was made, there have been several changes to building design guidance and policy, most notably fire regulations (following on from the Grenfell fire), and the GLA guidance to preparing energy strategies (including the introduction of CIBSE TM59 – *Design methodology for the assessment of overheating risk in homes*), as well as new policies published by LB Camden. This has warranted a number of changes to the design of the development, including changes to the design of the façade.

Furthermore, it was decided also to simplify the energy strategy for the Proposed Development, and it is now proposed to provide all heating and domestic hot water from the Somers Town Energy District Heating Network, which has been confirmed to have capacity for this supply. This is in line with the London Plan Policy.

The energy strategy has been developed in line with the London Plan and local planning policies set out by the London Borough of Camden. The energy strategy exceeds the targets set in the extant planning permission through following the Energy Hierarchy described in London Plan policy 5.2; Be Lean, Be Clean, Be Green.

Regulated CO_2 emissions reductions after each stage of the energy hierarchy are set out in Table 2 to Table 4 below.

Be lean

The Proposed Development is anticipated to meet the requirements of the Building Regulations Part L 2013 'gas boiler baseline' prior to the consideration of any Low or Zero Carbon (LZC) technologies, i.e. via passive design and energy efficiency measures. Section 2.1 details the target fabric and system performance parameters.

Table 2: Be lean results summary.

Domestic	Non-Domestic	Site-wide
Meet Part L 2013 'gas boiler baseline'	5-10% Reduction over Part L2A 2013 'gas boiler baseline'	0.9% Reduction over Part L2A 2013 'gas boiler baseline'*

*) The team will continue to endeavour to improve on the Be Lean target by further optimising the façade and system efficiencies to target a 7.9% improvement, in line with the consented scheme target.

Be clean

The strategy has been consolidated and simplified since the previous application.

The Proposed Development is expected to connect to the Somers Town Energy District Heating Network, which incorporates Combined Heat and Power (CHP).

This connection is anticipated to result in a further 53.7% reduction in CO_2 emissions beyond the baseline.

Table 3: Be clean results summary.

Domestic	Non-Domestic	Site-wide
57.3% Reduction over Part L1A baseline	10-15%** Reduction over Part L2A baseline	53.7% Reduction over Part L baseline

**) This will depend on the use class of the commercial area. For this planning amendment, this area has been assumed to be retail A3.

Be green

Due to changes in fire regulations, it is no longer proposed to incorporate PVs in the south-facing staircase glazing. A review has been undertaken of potentially incorporating PV on the rooftop, but it has been found that it would not be possible to access this area for maintenance and repairs, and therefore PV is not proposed.

Table 4: Be green results summary.

Domestic	Non-Domestic	Site-wide
57.3% Reduction over Part L1A baseline (No change from Be Clean)	10-15% Reduction over Part L2A baseline (No change from Be Clean)	53.7% Reduction over Part L baseline (No change from Be Clean)

The results confirm the proposed development is expected to achieve 53.7% carbon emission reductions over the Part L 2013 'gas boiler baseline'. This represents a 13.7% improvement in total carbon emission reductions compared to the consented scheme.

Tables and graphs overleaf give further detail.

Carbon dioxide emissions after each stage of the energy hierarchy
Table 5: Carbon emissions after each stage of energy hierarchy.

	Approved Strategy	Revised Strategy
	Total Regulated Emissions Tonnes CO_2/year	Total Regulated Emissions Tonnes CO_2/year
Part L baseline	71.4	83.4
Be lean.	65.8	82.6
Be clean.	55.2	38.6
Be green.	42.86	38.6

Regulated carbon dioxide savings from each stage of the energy hierarchy
Table 6: Regulated carbon emissions savings from each stage of the energy hierarchy.

	Approved Strategy		Revised Strategy	
	Tonnes CO_2/year	Percentage	Tonnes CO_2/year	Percentage
Savings from Be lean.	5.6	7.9%	1	0.9%
Savings from Be clean.	10.6	14.9%	44	52.8%
Savings from Be green.	12.34 (6.4 GAHP + 5.94 from PV)	17.2% (8.9% from GAHP + 8.3% from PV)	0	0%
Total reduction:	28.6	40%	45	53.7%
Target reduction:	71.4	35%	30	35%
Annual shortfall	none	none	none	none
Carbon offset payment Rate (£/tCO_2)	-		£1,800	
Offset payment	-		N/A	

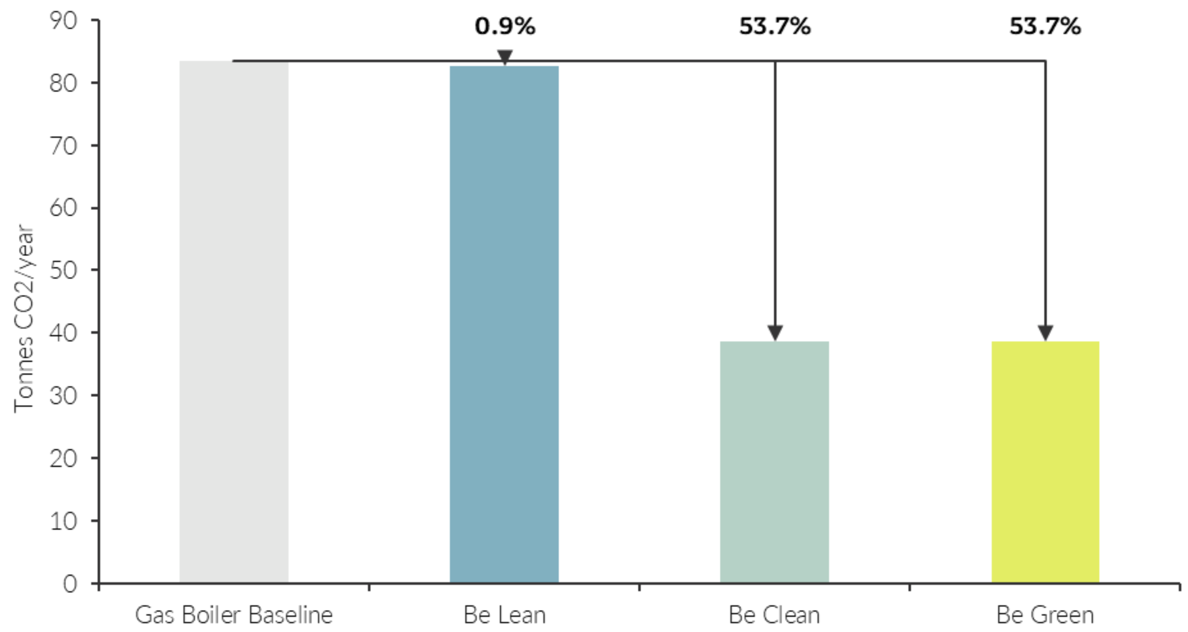


Figure 1: Estimated sitewide regulated carbon emissions for each stage of the energy hierarchy against the 'gas boiler baseline'.

Overheating risk assessment

A CIBSE TM52 overheating study was conducted for the Approved Application. As part of this supplementary energy strategy, an overheating risk assessment using the CIBSE TM59 methodology has been undertaken in line with current policy guidance on mitigation of residential overheating risk.

This has concluded that 100% of tested rooms are expected to pass the criteria in the 'adaptive criteria' scenario, i.e. with windows opened, when testing against the DSY1 summer weather file. This is in line with GLA guidance. Apartments have also been tested against the DSY2&3 weather files.

Please refer to Chapter 5 for details and results of the overheating risk assessment carried out for the Proposed Development.

1. The Strategy.

Brill Place Tower, hereafter referred to as the Approved Development, is located in the London Borough of Camden. The Approved Development is part of the Central Somers Town masterplan. The site is situated within a park near a residential area between Purchese Street and Midland Road.

1.1 Development Description

'An application pursuant to s73 of the Town and Country Planning Act 1990 (as amended) to vary conditions 2 (approved drawings), 3 (approved documents), 15 (quantum of housing, plot 7) and 80 (cycle parking, plot 7) of planning permission ref. 2015/2704/P) in relation to Plot 7, Central Somers Town.'

This application regards Amendments in relation to Plot 7; including: revisions to external appearance, revisions to floorplans including residential layout and ground floor layout, including internal and external structural columns, an increase in residential unit numbers from 54 to 68 units, and revisions to the energy strategy.

Table 7: Comparison of area schedules used in the energy strategy for the Approved Development and Revised scheme.

	Approved Scheme	Revised Scheme
Residential (C3)	54 dwellings	68 dwellings
Non-residential (m^2)		
Flexible Floorspace A1/A2/A3/D1	Non-residential areas were not included in previous energy strategy calculations.	60
Residential Amenities (D1)		72
Non-residential total		132

National Drivers

The following section outlines the policy targets at the time of the planning application.

Approved Document Part L of the Building Regulations
In line with the consented planning application, this supplementary energy strategy has been carried out using the carbon factors set within Part L 2013.

Masterplan Drivers

The following summarises the targets for energy strategy and carbon emission reductions as set out within the original application energy & sustainability strategy:

Sustainability Implementation Plan
The sustainability Implementation Plan (SIP) provides guidelines for the design team to deliver sustainability across the Central Somers Town development. The list below defines the targets as set out by the SIP which are relevant to Brill Place.

Site wide targets
- The Development is to achieve a minimum of 20% reduction in CO_2 emissions through on-site renewable energy generation
- 100% of internal and external light fittings to be energy efficient
- 100% of white goods to be energy efficient
- 100% of energy uses to be monitored and recorded
- Residential spaces to target 35% carbon emission reduction in CO_2 emissions for regulated uses

Residential targets
- All residential buildings to achieve a minimum 35% improvement on 2013 Part L of the Building Regulations
- All residential buildings to include appropriate clothes drying spaces (to reduce use of tumble driers).

Non-domestic targets
- Non-residential areas should target 35% reduction in CO_2 emissions for regulated uses on-site, when compared to Part L 2013 as a baseline.[1]

Local Policy Drivers (GLA and London Borough of Camden (LBC))

London Plan Policy
The policy for the application of energy and CO_2 emissions as set out in the original application document, and which is still targeted:

- Residential spaces should target 35% reduction in CO_2 emissions for regulated uses on-site, when compared to Part L 2013 as a baseline.
- Non-residential areas should target 35% reduction in CO_2 emissions for regulated uses on-site, when compared to Part L 2013 as a baseline.

Camden Local Plan (2017)
- Policy CC1: Climate change mitigation
- Policy CC2: Adapting to climate change

Camden Planning Guidance – Energy efficiency and adaptation (2019)
This document provides further detail on achieving the policies set out within the Camden Local Plan.

[1] There is a further target for non-domestic buildings to achieve a minimum Energy Performance Ratio for New Construction (EPR_{NC}) of 0.375 – however as this is a BREEAM-related target, it is considered to be applicable only to buildings targeting BREEAM ratings.

1.2 Revised energy strategy

Due to various policy changes since the planning consent was given for the Approved Development, the building design has been updated, especially the façade design and performance, as follows:

- Removal of motorised blinds (due to fire risk)
- Removal of integrated photovoltaics to glazed staircase (due to fire risk)
- Change to building façade build-up and the type insulation used (due to fire risk)

In summary, this has resulted in the requirement to update the façade design as follows:

- Amendments to the glazed-to-solid ratio of the façade elements to ensure high thermal performance, due to the move away from phenolic foam insulation
- Amendments to the glazed-to-solid ratio of the façade elements to mitigate overheating risk as far as is possible, due to the removal of motorised shutters, and the advent of CIBSE TM59 methodology
- Amendments to the façade to minimise thermal bridges and envelope thermal losses
- Amendments to staircase façade design to achieve fire protection

Furthermore, it has been decided to consolidate and simplify the energy strategy. The previous application proposed a connection to the Somers Town Energy District Heating Network to provide domestic hot water, with heating provided by gas air source heat pumps, and PV integrated in the southfacing façade of the glazed staircase.

The updated, optimised and simplified energy strategy proposes to increase the connection to the Somers Town Energy District Heating Network. Discussions have been undertaken with Vital Energy who operate the network on behalf of Camden Council, and it has been confirmed the energy network has capacity to provide all heating and hot water at Brill Place.

Detailed information regarding the capacity and efficiency of the energy centre has also been provided, and the updated energy strategy is based on this information. (Appendix C).

The total carbon emission reductions based on the measures set out above are expected to be 57.3% above the part L baseline, exceeding the savings proposed in the previous energy strategy.

The previous proposal of PV panels integrated into the south-facing façade of the staircase has been reviewed, and it is no longer considered viable for the following reasons:

- It would not be appropriate to install a PV system on a fire-fighting stair – particularly given the tall (over 45m) single stair design of the building. Specialist fire engineering consultants have reviewed the proposal, and they anticipate that proposing the system on / as part of the fire-fighting shaft would receive significant opposition from LFB during the approval process.
- The temperatures that would be expected inside the staircase circulation areas have been tested using dynamic modelling. Initial results show that high temperatures would be expected in this zone for most of the year. Therefore, it is proposed to mitigate these high temperatures by use of horizontal solar shading to most of the south facade– this would remove the benefit of PVs in this area.

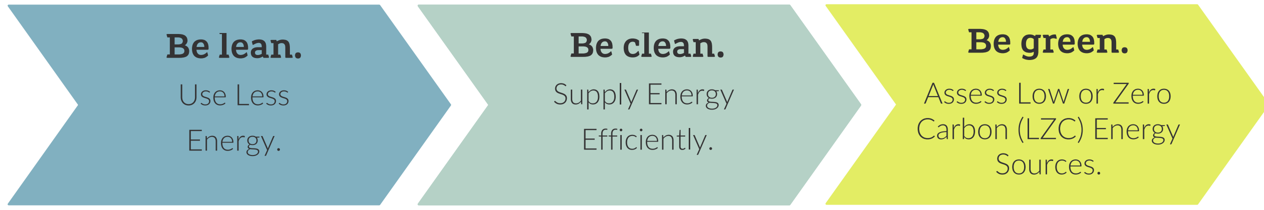
It has also been reviewed whether PV panels could be incorporated at the rooftop of the building. This review concluded that there is no viable access route for maintenance to such panels, and therefore it is not proposed to include PV panels here.

The updated results confirm the proposed development is expected to achieve 53.7% carbon emission reductions over the Part L 2013 'gas boiler baseline'. This represents a 13.7% improvement in total carbon emission reductions compared to the consented scheme.

This document provides a supplement to the approved energy strategies and sets out amendments for approval under this Section 73 application. As such, this document indicates the changes to the detailed calculations which have come as a result of developing this revised energy strategy.

1.3 Approach to the strategy

The revised Energy Strategy has been developed using a 'fabric first' approach through the 'be Lean', 'be Clean', 'be Green' energy hierarchy.



1.4 Definitions and limitations

Definitions:
The following definitions should be understood throughout this statement:

- **Energy demand:** the 'room-side' amount of energy which must be input to a space to achieve comfortable conditions. In the context of space heating, this is the amount of heat which is emitted by a radiator, or other heat delivery mechanism.
- **Energy requirement:** the 'system-side' requirement for energy (fuel). In the context of a space heating system using a gas boiler, this is the amount of energy combusted (e.g. gas) to generate useful heat (i.e. the energy demand).
- **Regulated CO_2 emissions:** the CO_2 emissions emitted as a result of the combustion of fuel, or 'consumption' of electricity from the grid, associated with regulated sources (those controlled by Part L of the Building Regulations).

Limitations:
The appraisals within this statement are based on Part L calculation methodology and should not be understood as a predictive assessment of likely future energy requirements or otherwise. Occupants may operate their systems differently, and / or the weather may be different from the assumptions made by Part L approved calculation methods, leading to differing energy requirements.

Assessment Methodologies
A sample of the proposed development has been assessed using approved Part L1A SAP methodology. Non-residential spaces have been benchmarked using recent, similar developments. This has provided the basis for the analysis of the designed building and the consideration of all applicable passive design, energy efficiency and Low or Zero Carbon (LZC) technologies.

The assessment makes use of the Mayor of London's Energy Hierarchy Be Lean – Be Clean – Be Green, and the cooling hierarchy from the London Plan (2016).

In line with current GLA guidance at the time of the extant planning approval, carbon emission reductions have been calculated using the carbon factors set out in Building regulations 2013 guidance (i.e. SAP 2012).

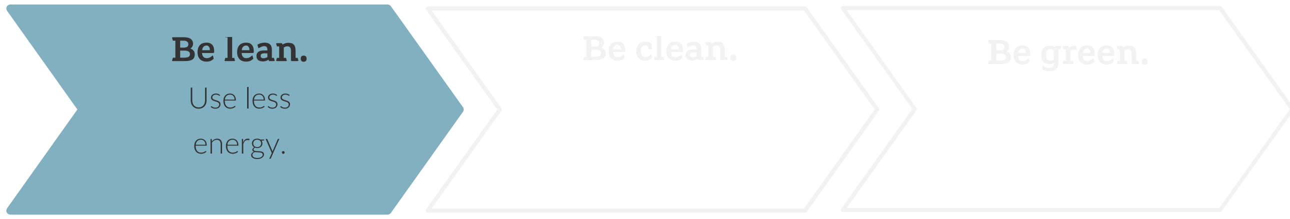
As the non-residential areas of the Proposed Development total less than 500m^2 GIA, it is not proposed to undertake a BREEAM Assessment for this development. This is in line with the consented Energy Strategy and the Camden Local Plan requirements.

Carbon factors
This assessment has been carried out using Part L 2013 carbon factors. This is justified on the basis of the connection to the Somers Town Energy District Heating Network which incorporates CHP, which is in line with the extant planning permission, and with GLA guidance.

Figure 2: The proposed development. Source: Stiff + Trevillion Architects

2. Be lean.

Passive design and energy efficiency measures form the basis for the reduction in overall energy demand and carbon emissions for the proposed development. This revised energy strategy aims to reduce the energy demand initially by optimising the envelope and building services within the development.



2.1 Passive design and energy efficiency features

Since the original planning application was made, there have been several changes to building design guidance and policy, most notably fire regulations (following on from the Grenfell fire), and the GLA guidance to preparing energy strategies (including the introduction of CIBSE TM59 – *Design methodology for the assessment of overheating risk in homes*), as well as new policies published by LB Camden. This has warranted a number of changes to the design of the development, including changes to the design of the façade, especially the following:

The composite U-values as included in the original energy strategy have been assessed by façade consultants from Maffeis. It has been found that some of these values are no longer achievable. It is likely that the previous strategy would have used phenolic foam insulation and this type of insulation is no longer proposed for tall buildings following the Grenfell Tower fire.

Updated U-values have been included into the Part L calculations. The impact of this change has been significant, and it has been necessary to implement changes to the consented elevational treatments (for example solid to glass ratios) to achieve compliance with Building Regulation L and the associated fabric efficiency standards. Figure 3 (overleaf) shows the proposed façade design which has resulted from these changes.

In the time since the previous planning application submission, there have also been changes to the SAP calculation methodology, which means that thermal bridges are now accounted for in greater detail than previously. As a result, it has been necessary to rationalise the façade to minimise thermal bridges and envelope thermal losses.

Furthermore, the previously consented energy strategy was based on the use of medium-to-high thermal mass, which would have provided benefits to the results in terms of improved carbon emission reductions. However, this input is not realistically achievable for a high-rise building such as Brill Place, as this would require heavyweight structures such as blockwork walls and concrete ceilings exposed to the interior of apartments. Therefore, an input of low thermal mass has been used, representative of residential tower developments such as this with a curtain walling façade and plasterboard interior walls.

The updated performance values developed and agreed in collaboration with architect Stiff + Trevillion and façade consultant Maffeis are summarised in Table 8.

Table 8: Building Fabric Performance Characteristics

	Previous application values	Updated application values
Exposed Floor U-value (W/m^2K)	0.13	N/A Eliminated with rationalised design
External Wall U-value (W/m^2K)	0.15 (opaque areas) (assumed this did not include thermal bridging)	0.13-0.15 (opaque areas)
Roof U-value (W/m^2K)	0.13	0.13
Glazing U-value and g-value (W/m^2K)	1.0 (assumed this did not include thermal bridging) g value: 0.36	Curtain walling: 1.15-1.59 g value: 0.4
Air Permeability ($m^3/h.m^2$ @ 50Pa)	3.0	3.0
Thermal bridging ψ-value (W/mK)	'Approved' thermal bridging' This input provides very little detail on how reductions will actually be achieved. While carbon reductions can potentially achieved in theory from use of this input, in reality, approved construction details are usually not applicable to highrise developments, and therefore detailed calculations would have had to be carried out by a specialist façade consultant during detailed design.	Balcony connections: 0.04 (assuming a thermally broken detail) 'Normal' vertical corners: 0.18 (default value) 'Inverted' vertical corners: 0 (default value) Flat Roof connection: 0.08 (default value) All other thermal bridges for the façade included in U-value calculations for walls/windows given above, as confirmed and calculated by Maffeis façade consultants
Thermal mass parameter (kJ/m^2K)	Medium to high: Unrealistic value for buildings such as this. This input would have provided the previous applicant with a carbon reduction benefit which would be unlikely to be achieved in the detailed design or post construction stages. See appendix F for a description of typical thermal mass for illustrative constructions.	'low' (~100) See appendix G for a description of typical thermal mass for illustrative constructions.

Figure 3: Proposed scheme elevations – from top left to bottom right: North, East, South, West.

2.2 Be lean results

Following the 'Be Lean' strategy of the Approved Development, the design development described above has resulted in associated CO_2 emissions set out in Table 9 and Table 10 below.

Domestic carbon performance

Table 9: Domestic carbon performance.

Dwellings, area weighted average	Dwelling emission rate (DER) kg.CO_2/year	Target emission rate (TER) kg.CO_2/year	Percentage variance
Dwellings	17.01	17.07	0.4%

Non-domestic carbon performance

Table 10: Non-domestic carbon performance (from Benchmark).

Space Reference	Building emission rate (DER) kg.CO_2/year	Target emission rate (TER) kg.CO_2/year	Percentage variance
Retail area	80.5	87.8	8.3%
Residential amenity	16.9	17.5	3.4%

Site-wide performance

Table 11: 'Be lean' sitewide regulated carbon performance.

Development emission rate:	82.6 tonnes.CO_2/year
Target emission rate:	83.4 tonnes.CO_2/year
Percentage variance:	0.9%

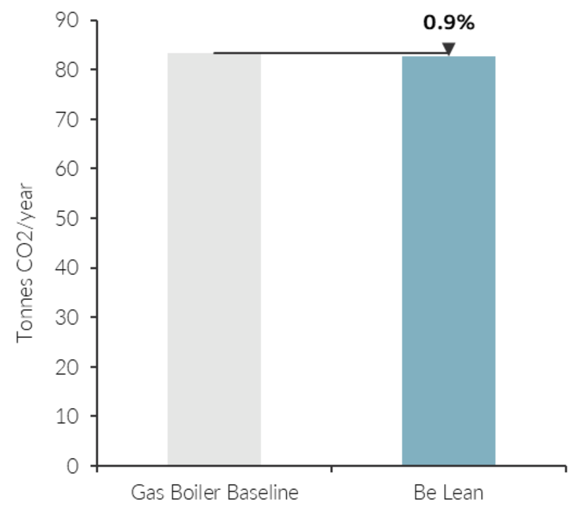
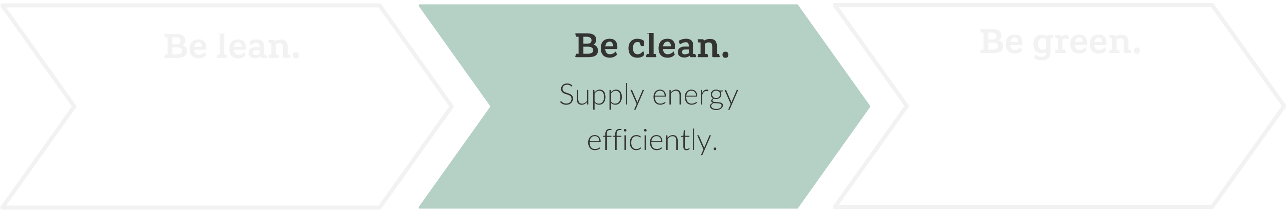


Figure 4: Be lean results summary.

The team will continue to endeavour to improve on the Be Lean target by further optimising the façade and system efficiencies to target a 7.9% improvement, in line with the consented scheme target.

3. Be clean.

This stage of the energy hierarchy refers to the use of heat networks or on-site Combined Heat and Power (CHP) in order to provide energy and reduce consumption from the national electricity grid and gas networks, through the generation of electricity, heating and cooling on-site.



3.1 Development demand

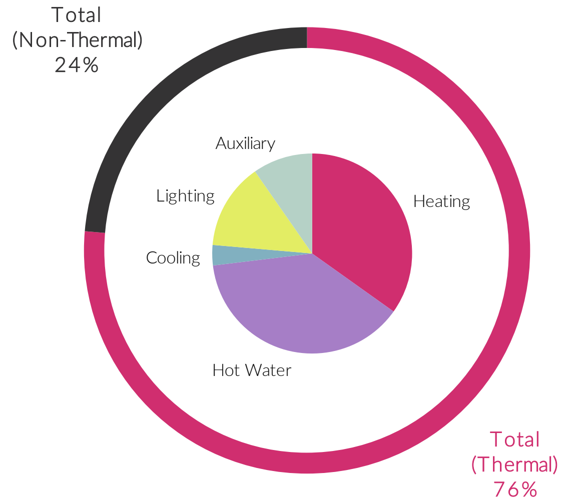


Figure 5: Thermal and electrical demand chart.

3.2 Be clean: network and technologies

It has been decided to consolidate and simplify the energy strategy. The previous application proposed a connection to the Somers Town Energy District Heating Network to provide domestic hot water only (with heating provided by gas air source heat pumps, and PV integrated in the southfacing façade of the glazed staircase – both discussed in the Be Green section of this report).

The updated, optimised and simplified energy strategy proposes to increase the connection to the Somers Town Energy District Heating Network. Discussions have been undertaken with Vital Energy who operate the network on behalf of Camden Council, and it has been confirmed the energy network has capacity to supply all required heating and hot water to Brill Place.

Correspondence with Vital Energy, who operate the network on behalf of Camden, confirms that there is capacity to provide the required energy from this low carbon energy source.

Detailed information regarding the installed capacity and efficiency of equipment and the energy centre has been provided, and the updated energy strategy is based on this information. (Appendix C)

As a result of this discussion, it is proposed to increase reliance upon the district energy connection as per current policy. This strategy is simpler and will be easier to maintain and operate compared to the previous strategy, which incorporated Gas Air Source Heat Pumps for the Space Heating.

The updated energy strategy thus follows the energy hierarchy Be Lean – Be Clean – Be Green, i.e. focusing on passive design and energy efficiency and district energy connection first of all, before the consideration of renewable energy allocation.It is expected that this strategy will result in carbon emission reductions for the development which improve upon the previous energy strategy results.

Please refer to Table 12 below for the efficiencies of the CHP which have been advised by the network operator. Appendix C contains correspondence with the district network operator, and Appendix D contains the proposed basement plan showing the connection to the district energy network.

Table 12: Somers Town Energy District Heating Network – Data received and used in energy strategy

CHP proportion of heat	75%
CHP thermal efficiency	44%
CHP electrical efficiency	42%
CHP heat-to-power ratio	1.06
Boiler efficiency	89%

Decentralised Energy Network with CHP
The anticipated load profile of the Brill Place Tower development and the approved planning application ensure that the connection to the local Somers Town Energy District Heating Network remains a viable and effective solution for the development.

The Proposed Development benefits from significant CO_2 reduction from the connection to the decentralised energy network due to the high efficiency and low heat to power ratio of the CHP plant which powers the energy network.

3.3 Be clean summary

It is anticipated that the Proposed Development will achieve up to a 53.7% reduction in annual regulated CO_2 emissions beyond the requirements of the Building Regulations Part L 2013 via the connection to the district heat network with CHP.

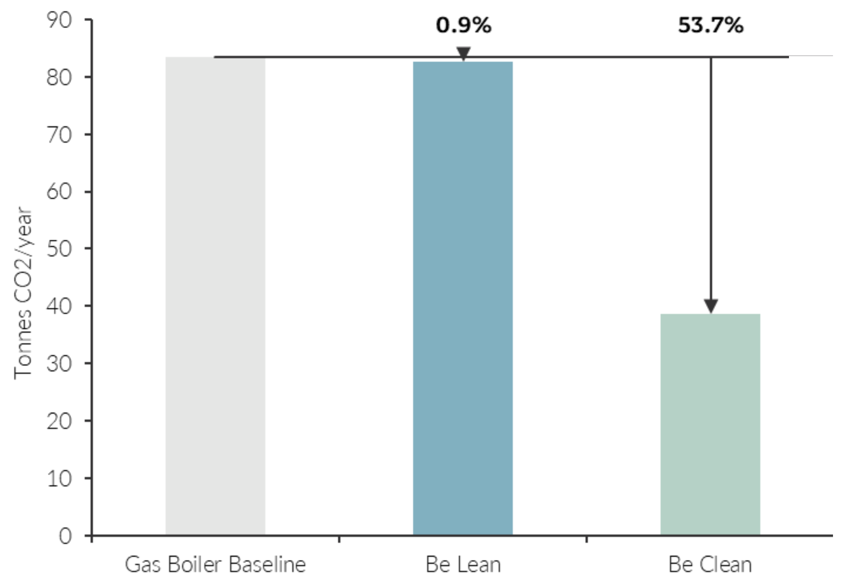


Figure 6: Be clean results summary.

4. Be green.

The final step of the energy hierarchy explores the feasibility of Low and Zero Carbon (LZC) technologies to allow for the production of renewable energy onsite in order to offer a further reduction in carbon emissions.

Be lean. | Be clean. | **Be green.** Assess 'low or zero carbon' (LZC) energy sources.

4.1 Low and zero carbon (LZC) technology assessment

An LZC technology assessment was undertaken as part of the Approved Application, please refer to application 2015/2704/P for further details.

For the Be Green stage, the previous application proposed heating by gas air source heat pumps, and PV cells integrated in the southfacing façade of the glazed staircase.

The updated, optimised and simplified energy strategy proposes instead to increase the connection to the Somers Town Energy District Heating Network, as set out in section 3 above.

This connection is expected to result in carbon emission reductions exceeding those of the previous energy strategy.

The previous proposal of PV panels integrated into the south-facing façade of the staircase has been reviewed. This is no longer considered a viable design solution for the following reasons:

- It would not be appropriate to install a PV system on / as part of the fire-fighting stair – particularly given the tall (over 45m) single stair design of the building. Specialist fire engineering consultants have reviewed the proposal, and they anticipate that proposing the system on / as part of the fire-fighting shaft would receive significant opposition from LFB during the approval process
- The temperatures that would be expected inside the staircase circulation areas have been tested using dynamic modelling. Initial results show that high temperatures would be expected in this zone for most of the year. Therefore, it is proposed to mitigate these high temperatures by use of horizontal solar shading to most of the south façade – this would remove the benefit of PVs in this area.

It has been assessed whether a photovoltaic array could be installed on the top-most roof of the residential tower, as this would be expected to be unshaded for much of the year (see Figure 7). This assessment was made notwithstanding that PV was not proposed on this surface in the consented scheme proposal.

An assessment by an access specialist has confirmed that, although it may be possible to access the area in question for cleaning via a long tool from the BMU track, it would not be feasible to gain access for maintenance to this area with hand tools. Therefore, should the panels malfunction, it is not expected that it would be possible to access the area for repairs.

PVs are therefore not proposed in this area.

4.2 Be green summary

Following the 'Be green' strategy of the Approved Development, the design development has resulted in associated estimated CO_2 emissions as set out in Figure 8.

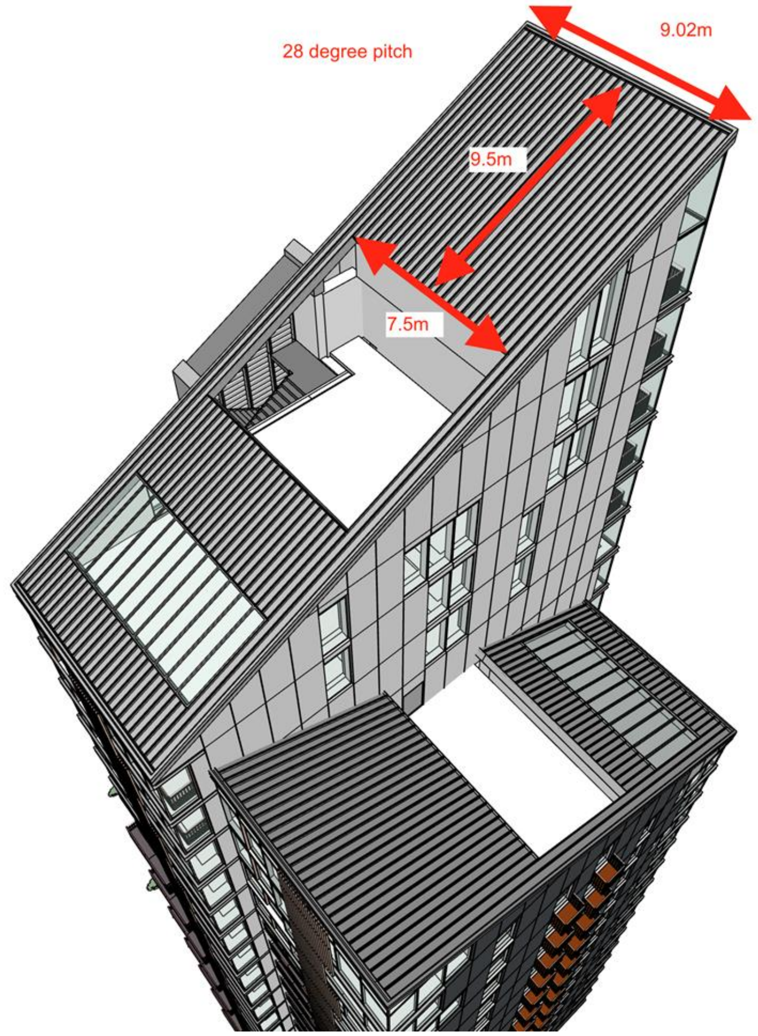


Figure 7: Roof area assessed for PV array.

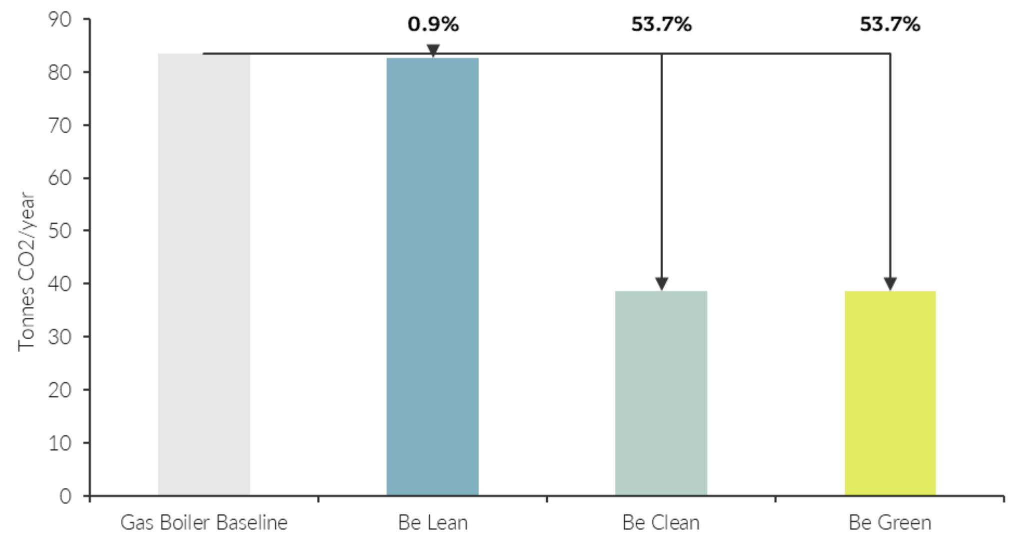


Figure 8: Be green results summary.

5. Cooling and overheating.

5.1 Cooling hierarchy

The proposed development has been designed to minimise its use of active cooling systems through passive and efficiency measures.

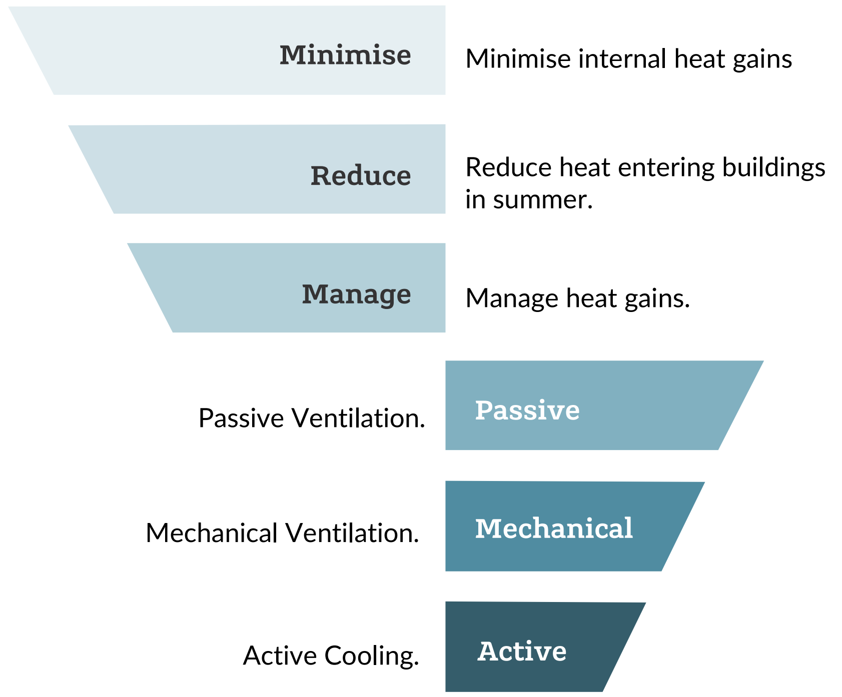


Figure 9: Cooling hierarchy.

5.2 Mitigation strategy

Due to updates to the fire regulations, it has been necessary to remove motorised blinds from the façade design. Specialist fire consultants have reviewed the previous proposal, and provided the following comment:

The Building (Amendment) Regulations 2018 impose combustibility requirements on all items which constitute the external wall or 'specified attachments', which specifically include solar shading and balconies. All materials forming the solar shading itself, or any control gear which is located in the wall build up, must be of Class A1 or A2-s1,d0 and hence motorised blinds will not be acceptable.

This, in line with other updates required for reasons set out in section 2 above, have resulted in several amendments made to the façade design.

In summary, the Proposed Development follows the steps of the cooling hierarchy to minimise risks of overheating in summer. The Proposed Development seeks to minimise internal heat generation through energy efficient building services, facades, and external shading elements. It also provides opportunities for passive ventilation through openable windows in all apartments within the development. There will also be MVHR units providing background mechanical ventilation to further reduce the risk of overheating in summer.

Comfort cooling is also still proposed in the design of the domestic elements of the approved development. Furthermore, as the commercial space will be constructed as 'shell and core', it is expected that comfort cooling can also be incorporated into that space by the future tenants as part of their fit-out.

5.3 Residential overheating risk assessment – original application

A residential overheating risk assessment was conducted for the Approved Application at the time of the original planning application. This was prepared prior to the advent of the CIBSE TM59 methodology, and therefore results are not directly comparable to updated results. Main differences would be to inputs for internal gains and profiles (previously there was no set methodology for these specific inputs), and also the weather files tested differed. However, the previous test did comprise a dynamic modelling exercise, setting targets against CIBSE TM52. Results were reported as shown in the image below:

			1976				1989				2003			
Typical Floor Flats	Room	Orientation	1	2	3	Result	1	2	3	Result	1	2	3	Result
1 Bed Flat	Lounge/Kitchen	SW	FAIL	FAIL	FAIL	FAIL	PASS	FAIL	PASS	PASS	PASS	FAIL	FAIL	FAIL
	Bedroom 1	NW	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
2 Bed Flat (SW)	Lounge/Kitchen	SW	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 1	NW	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 2	NW	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
2 Bed Flat (NE)	Lounge/Kitchen	NE	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 1	NE	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 2	NE	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Penthouses														
Level 15 Penthouse	Lounge/Kitchen	SW	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	Bedroom 1	NE	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 2	NE	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 3	NW	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Level 18 Penthouse	Lounge/Kitchen	NE	FAIL	FAIL	FAIL	FAIL	PASS	FAIL	PASS	PASS	PASS	FAIL	FAIL	FAIL
	Lounge	NE	PASS	FAIL	PASS	PASS	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 1	SW	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 2	SW	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 3	SW	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Level 20 Penthouse	Lounge/Kitchen	SW	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	Lounge	SW	FAIL	FAIL	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	FAIL	FAIL	FAIL
	Bedroom 1	SW	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 2	SW	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
	Bedroom 3	NE	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Figure 10: Previous application overheating risk assessment results including the use of motorised shading system

As can be seen, a number of tested rooms previously failed the criteria in each of the weather files tested.

5.3.1 Assessment methodology – revised application

As part of this supplementary energy strategy, an updated overheating risk assessment in line with CIBSE TM59 *Design Methodology for the assessment of overheating risk in homes* has been undertaken in line with current policy guidance on mitigation of residential overheating risk.

The sample of dwellings assessed are outlined in Figure 11 and Figure 12 below. A total of 8 dwellings have been selected for the risk assessment as they have been identified to present a representative sample with higher levels of overheating risks based on their height above ground (two typical floors are modelled towards the top of the building where overshading will be minimal).

Figure 11: Sample apartments from Level 14

Figure 12: Sample apartments from Level 15

The assessment was also based on the most appropriate weather file for this site, which is London Weather Centre, and has accounted for future projected climate scenarios. All modelling inputs used in the TM59 overheating risk assessment are summarised in Table 13 below.

Furthermore, the GLAs Overheating Checklist has been completed – please refer to appendix E.

Table 13: TM59 inputs used

Software	IESve 2018	Window Covering (SF = Shading Factor)	None
Weather Data	Design Summer Year (DSY1) London Weather Centre 2020 High Emissions Scenario 50th Percentile	Window opening type	-The master side hung bedroom windows in the 2 bed apartments onto the Juliet balconies open 90° (full height). - The side hung bedroom windows generally can open to 20°. - Side hung living room (behind shade) open 90°.
Assessment Criteria	CIBSE TM59	Occupancy	Bedrooms: 24/7 Living room/ Kitchens: 09:00-22:00
Façade U-values	See Table 8 in Section 2	Max. Occupancy Density	1 Bed – 2 People 2 Bed – 4 People 3 Bed – 6 People
Background Ventilation Rate	2.5 ACH	Occupancy Heat Gains	75 W/ person (Sensible) 55W / person (Latent)
Infiltration	0.15 ACH	Lighting Gains	2 W/m^2 (All areas)
Communal Corridor Ventilation Rate	2 ACH		

5.3.2 Predominantly naturally ventilated scenario

The results in the following table summarise the overheating risks of the sample dwellings in a predominantly naturally ventilated scenario. A dwelling is deemed to meet CIBSE TM59 requirements where the following criteria have been met:

- Criterion 1) whereby all living rooms, kitchens, and bedrooms must not exceed the maximum adaptive context threshold for more than 3% of total occupied hours from May to September,
- Criterion 2) whereby all bedrooms must not exceed the maximum operative temperature threshold of 26°C for more than 1% of annual occupied hours during the night (22:00-07:00)

5.3.3 Results summary

Table 14: TM59 results summary

Weather file	London_LWC_DSY1_2020High50		London_LWC_DSY2_2020High50		London_LWC_DSY3_2020High50	
	Criterion 1 (Living rooms, kitchens, bedrooms)	Criterion 2 (Bedrooms only)	Criterion 1 (Living rooms, kitchens, bedrooms)	Criterion 2 (Bedrooms only)	Criterion 1 (Living rooms, kitchens, bedrooms)	Criterion 2 (Bedrooms only)
Results (Pass Rate)	100%	100%	35%	0%	40%	33%

The results from the overheating risk analysis against London Design Summer Year 1 (DSY1) demonstrate that all inhabitable rooms (i.e. bedrooms, living rooms and kitchens) pass Criterion 1, and all bedrooms tested pass Criterion 2 (adaptive scenario). This demonstrates a significant improvement against the previous TM52 assessment undertaken on the consented scheme. By expanding the sample size from 6 dwellings to 8, the current assessment captures a broader range of apartments, hence a is more representative of the development as a whole.

Results for DSY2 and DSY3 are presented in line with GLA requirements.

6. Conclusion.

This supplementary energy report provides a revised energy strategy for the Brill Place Tower with an update to the carbon savings achieved by the Approved Development following minor design and systems changes.

6.1 The energy strategy

Since the original planning application was made, there have been several changes to building design guidance and policy, most notably fire regulations (following on from the Grenfell fire), and the GLA guidance to preparing energy strategies (including the introduction of CIBSE TM59 – *Design methodology for the assessment of overheating risk in homes*), as well as new policies published by LB Camden. This has warranted a number of changes to the design of the development, including changes to the design of the façade.

Results of these design changes are incorporated into the results reported here.

It has also been decided to consolidate and simplify the energy strategy. The previous application proposed a connection to the nearby district energy network to provide domestic hot water, with heating provided by Gas air source heat pumps, and PV integrated in the southfacing façade of the glazed staircase.

The updated, optimised and simplified energy strategy proposes to increase the connection to the Somers Town Energy District Heating Network. Discussions have been undertaken with Vital Energy who operate the network on behalf of Camden Council who, and it has been confirmed the energy network has capacity to provide all heating and hot water at Brill Place.

Detailed information regarding the installed capacity and efficiency of equipment and the energy centre has been provided, and the updated energy strategy is based on this information.

The total carbon emission reductions based on the measures set out above are anticipated to be 53.7%, exceeding the savings proposed in the previous energy strategy by 13.7%.

Table 15: Energy strategy summary.

Be lean	0.9% sitewide betterment achieved against Part L baseline. High energy efficient building fabric and building services have been utilised to reduce carbon emissions and energy demand through good practice passive measures.
Be clean	A further 52.8% sitewide betterment achieved through connection to a district heat network with CHP. The revised energy strategy takes the opportunity to increase the previously proposed connection to the Somers Town Energy District Heating Network which has been installed as part of the wider masterplan for the development site. This heat network will be served by CHP and gas fired boilers. The previous approved strategy proposed to use this connection or domestic hot water only. This revised energy strategy proposed to increase this connection to also provide space heating to the development.
Be green	No further savings achieved through LZC technologies. The previous energy strategy proposed Gas Air Source Heat Pumps to provide space heating, and PV panels integrated into the glazed façade of the south-facing staircase. The updated strategy proposed, in line with the energy hierarchy, to provide all pace heating form the district energy network. The proposal for PV integrated in the façade has been assessed and found no longer to be viable for reasons of fire strategy updates and design changes necessary due to the expected high temperatures that would be experienced in the staircase. Further, as an alternative it has been assessed whether PV could be allocated on the roof, however this has been discounted due to lack of viable maintenance access.

Results

Table 16: Carbon reduction and savings breakdown.

	Approved Strategy		**Revised Strategy**	
	Tonnes CO_2/year	Percentage	Tonnes CO_2/year	Percentage
Savings from Be lean.	5.6	7.9%	1	0.9%
Savings from Be clean.	10.6	14.9%	44	52.8%
Savings from Be green.	12.34 (6.4 GAHP + 5.94 from PV)	17.2% (8.9% from GAHP + 8.3% from PV)	0	0%
Total reduction:	28.6	40%	45	53.7%
Target reduction:	71.4	35%	30	35%
Annual shortfall	none	none	none	none
Carbon offset payment Rate (£/tCO_2)	-		£1,800	
Offset payment	-		N/A	

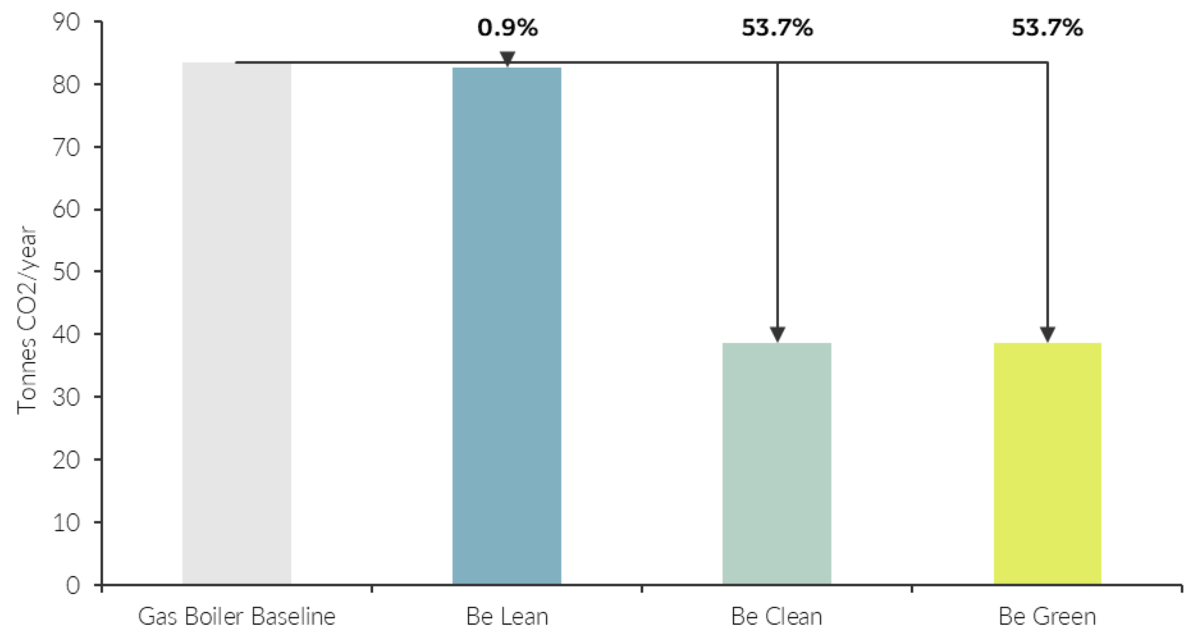


Figure 13: Estimated sitewide regulated carbon emissions for each stage of the energy hierarchy against the 'gas boiler baseline'.

6.2 Overheating risk assessment

A CIBSE TM52 overheating study was conducted for the original Approved Application. As part of this supplementary energy strategy, an overheating risk assessment in line with CIBSE TM59 has been undertaken in line with current policy guidance on mitigation of residential overheating risk.

The results from the overheating risk analysis against London Design Summer Year 1 (DSY1) demonstrate that 100% of all habitable rooms (i.e. bedrooms, living rooms and kitchens) pass Criterion 1, and all bedrooms tested pass Criterion 2 (adaptive scenario). This demonstrates a significant improvement against the previous TM52 assessment undertaken on the consented scheme.

Appendix A: SAP data sheets.

Be lean data sheets

DER Worksheet
Design - Draft

NHER

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Miss Holly Clifton	Assessor number	22160
Client		Last modified	15/11/2019
Address	3 1 E 1, London, NW1 1HG		

1. Overall dwelling dimensions

		Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied		55.00	(1a)	x	2.60	(2a)	=	143.00	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	55.00	(4)						
Dwelling volume							(3a) + (3b) + (3c) + (3d)...(3n) =	143.00	(5)

2. Ventilation rate

				m³ per hour	
Number of chimneys		0	x 40 =	0	(6a)
Number of open flues		0	x 20 =	0	(6b)
Number of intermittent fans		0	x 10 =	0	(7a)
Number of passive vents		0	x 10 =	0	(7b)
Number of flueless gas fires		0	x 40 =	0	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)		0.15	(18)
Number of sides on which the dwelling is sheltered		2	(19)
Shelter factor	1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(18) x (20) =	0.13	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	77.35	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(24a)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(25)

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3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Door			1.89	x	1.40	=	2.65			(26)
Window			7.15	x	1.01	=	7.20			(27)
Window			9.31	x	1.10	=	10.24			(27)
Window			2.76	x	1.12	=	3.08			(27)
Window			1.14	x	1.32	=	1.50			(27)
External wall			15.42	x	0.14	=	2.16			(29a)
External wall			39.96	x	0.13	=	5.19			(29a)
Party wall			11.90	x	0.00	=	0.00			(32)
External wall			0.24	x	1.17	=	0.28			(29a)
External wall			0.89	x	1.15	=	1.02			(29a)
External wall			2.15	x	1.39	=	2.99			(29a)
Total area of external elements ∑A, m²			80.91							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	36.32	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		100.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		2.43	(36)
Total fabric heat loss	(33) + (36) =	38.75	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly 0.33 x (25)m x (5)	13.02	12.87	12.71	11.96	11.81	11.06	11.06	10.91	11.36	11.81	12.11	12.41	(38)
Heat transfer coefficient, W/K (37)m + (38)m	51.76	51.61	51.46	50.71	50.56	49.81	49.81	49.66	50.11	50.56	50.86	51.16	
Average = ∑(39)1...12/12 =												50.67	(39)
Heat loss parameter (HLP), W/m²K (39)m ÷ (4)	0.94	0.94	0.94	0.92	0.92	0.91	0.91	0.90	0.91	0.92	0.92	0.93	
Average = ∑(40)1...12/12 =												0.92	(40)
Number of days in month (Table 1a)	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	1.84	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	77.84	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	85.62	82.51	79.39	76.28	73.17	70.05	70.05	73.17	76.28	79.39	82.51	85.62	
∑(44)1...12 =												934.05	(44)
Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)	126.97	111.05	114.60	99.91	95.86	82.72	76.65	87.96	89.01	103.74	113.24	122.97	
∑(45)1...12 =												1224.68	(45)
Distribution loss 0.15 x (45)m	19.05	16.66	17.19	14.99	14.38	12.41	11.50	13.19	13.35	15.56	16.99	18.45	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	1.00	(47)
Water storage loss:		
a) If manufacturer's declared loss factor is known (kWh/day)	0.20	(48)
Temperature factor from Table 2b	1.00	(49)

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Energy lost from water storage (kWh/day) (48) x (49)	0.20	(50)
Enter (50) or (54) in (55)	0.20	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water storage loss calculated for each month (55) x (41)m	6.20	5.60	6.20	6.00	6.20	6.00	6.20	6.20	6.00	6.20	6.00	6.20	(56)
If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)	6.20	5.60	6.20	6.00	6.20	6.00	6.20	6.20	6.00	6.20	6.00	6.20	(57)
Primary circuit loss for each month from Table 3	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for each month from Table 3a, 3b or 3c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m	156.44	137.66	144.06	128.42	125.33	111.23	106.12	117.42	117.53	133.20	141.75	152.43	(62)
Solar DHW input calculated using Appendix G or Appendix H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from water heater for each month (kWh/month) (62)m + (63)m	156.44	137.66	144.06	128.42	125.33	111.23	106.12	117.42	117.53	133.20	141.75	152.43	

∑(64)1...12 = 1571.58 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]	65.79	58.21	61.67	56.03	55.44	50.31	49.06	52.82	52.41	58.06	60.46	64.46	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5)	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.28	12.68	10.32	7.81	5.84	4.93	5.33	6.92	9.29	11.80	13.77	14.68	(67)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.19	161.85	157.66	148.74	137.49	126.91	119.84	118.18	122.36	131.28	142.54	153.12	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.19	32.19	32.19	32.19	32.19	32.19	32.19	32.19	32.19	32.19	32.19	32.19	(69)
Pump and fan gains (Table 5a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (Table 5)	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	(71)
Water heating gains (Table 5)	88.43	86.63	82.89	77.82	74.52	69.88	65.94	70.99	72.79	78.04	83.97	86.64	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m	313.45	311.72	301.43	284.93	268.41	252.28	241.66	246.65	255.00	271.68	290.84	304.99	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
NorthEast	0.30	x	2.86	x	11.28	x 0.9 x	0.40	x	0.90	=	3.14	(75)
NorthEast	0.77	x	13.60	x	11.28	x 0.9 x	0.40	x	0.90	=	38.28	(75)
NorthWest	0.77	x	2.76	x	11.28	x 0.9 x	0.40	x	0.90	=	7.77	(81)
SouthEast	0.77	x	1.14	x	36.79	x 0.9 x	0.40	x	1.00	=	11.63	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains in watts ∑(74)m...(82)m	60.81	119.93	207.49	329.83	435.83	461.88	433.15	349.60	249.15	144.25	75.82	50.12	(83)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total gains - internal and solar (73)m + (83)m	374.27	431.65	508.92	614.76	704.24	714.16	674.81	596.25	504.15	415.93	366.66	355.11	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area n1,m (see Table 9a)	0.95	0.93	0.87	0.75	0.59	0.42	0.32	0.37	0.60	0.83	0.93	0.96	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)	19.22	19.49	19.94	20.46	20.80	20.94	20.98	20.97	20.84	20.36	19.71	19.17	(87)
Temperature during heating periods in the rest of dwelling from Table 9, Th2(˚C)	20.13	20.13	20.14	20.15	20.15	20.16	20.16	20.17	20.16	20.15	20.15	20.14	(88)
Utilisation factor for gains for rest of dwelling n2,m	0.94	0.92	0.85	0.72	0.55	0.37	0.26	0.31	0.54	0.80	0.92	0.95	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	17.74	18.13	18.76	19.49	19.93	20.11	20.15	20.15	20.00	19.38	18.46	17.68	(90)

Living area fraction — Living area ÷ (4) = 0.69 (91)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2	18.75	19.06	19.57	20.16	20.52	20.68	20.72	20.71	20.58	20.06	19.31	18.70	(92)
Apply adjustment to the mean internal temperature from Table 4e where appropriate	18.75	19.06	19.57	20.16	20.52	20.68	20.72	20.71	20.58	20.06	19.31	18.70	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm	0.93	0.90	0.84	0.72	0.56	0.41	0.30	0.35	0.57	0.80	0.90	0.94	(94)
Useful gains, ηmGm, W (94)m x (84)m	348.69	389.53	428.38	443.90	396.95	289.72	201.42	208.01	288.01	332.95	331.55	333.54	(95)
Monthly average external temperature from Table U1	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]	748.20	730.86	672.42	570.85	446.10	302.95	205.26	214.14	324.65	478.05	621.21	742.01	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m	297.24	229.37	181.57	91.40	36.57	0.00	0.00	0.00	0.00	107.95	208.56	303.90	

∑(98)1...5, 10...12 = 1456.56 (98)

Space heating requirement kWh/m²/year — (98) ÷ (4) 26.48 (99)

8c. Space cooling requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm	0.00	0.00	0.00	0.00	0.00	468.18	368.57	377.38	0.00	0.00	0.00	0.00	(100)
Utilisation factor for loss ηm	0.00	0.00	0.00	0.00	0.00	0.93	0.96	0.94	0.00	0.00	0.00	0.00	(101)
Useful loss ηmLm (watts) (100)m x (101)m	0.00	0.00	0.00	0.00	0.00	435.91	352.15	354.11	0.00	0.00	0.00	0.00	(102)
Gains	0.00	0.00	0.00	0.00	0.00	909.56	861.61	767.97	0.00	0.00	0.00	0.00	(103)
Space cooling requirement, whole dwelling, continuous (kWh) 0.024 x [(103)m - (102)m] x (41)m	0.00	0.00	0.00	0.00	0.00	341.03	379.04	307.91	0.00	0.00	0.00	0.00	

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	∑(104)6...8 =	1027.98	(104)
Cooled fraction	cooled area ÷ (4) =	0.82	(105)
Intermittency factor (Table 10)			

0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.25	0.00	0.00	0.00	0.00

	∑(106)6...8 =	0.75	(106)
Space cooling requirement (104)m x (105) x (106)m			

0.00	0.00	0.00	0.00	0.00	69.76	77.53	62.98	0.00	0.00	0.00	0.00

	∑(107)6...8 =	210.27	(107)
Space cooling requirement kWh/m²/year	(107) ÷ (4) =	3.82	(108)

9b. Energy requirements - community heating scheme

Fraction of space heat from secondary/supplementary system (table 11)	'0' if none	0.00	(301)
Fraction of space heat from community system	1 - (301) =	1.00	(302)
Fraction of community heat from boilers		1.00	(303a)
Fraction of total space heat from community boilers	(302) x (303a) =	1.00	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating		1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating		1.00	(305a)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating

Annual space heating requirement	1456.56			(98)
Space heat from boilers		(98) x (304a) x (305) x (306) =	1529.39	(307a)

Water heating

Annual water heating requirement	1571.58			(64)
Water heat from boilers		(64) x (303a) x (305a) x (306) =	1650.16	(310a)
Electricity used for heat distribution		0.01 × [(307a)...(307e) + (310a)...(310e)] =	31.80	(313)
Cooling System Energy Efficiency Ratio			4.05	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)		(107) ÷ (314)	51.92	(315)
Electricity for pumps, fans and electric keep-hot (Table 4f)				
mechanical ventilation fans - balanced, extract or positive input from outside	114.79			(330a)
Total electricity for the above, kWh/year			114.79	(331)
Electricity for lighting (Appendix L)			252.20	(332)
Total delivered energy for all uses		(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =	3598.46	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from boilers	1529.39	x	4.24	x 0.01 =	64.85	(340a)
Water heating from boilers	1650.16	x	4.24	x 0.01 =	69.97	(342a)
Space cooling	51.92	x	13.19	x 0.01 =	6.85	(348)
Pumps and fans	114.79	x	13.19	x 0.01 =	15.14	(349)
Electricity for lighting	252.20	x	13.19	x 0.01 =	33.27	(350)
Additional standing charges					120.00	(351)
Total energy cost				(340a)...(342e) + (345)...(354) =	310.07	(355)

11b. SAP rating - community heating scheme

Energy cost deflator (Table 12)	0.42	(356)

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Energy cost factor (ECF)	1.30	(357)
SAP value	81.83	
SAP rating (section 13)	82	(358)
SAP band	B	

12b. CO_2 emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from other sources (space heating)							
Efficiency of boilers		89.50					(367a)
CO2 emissions from boilers	[(307a)+(310a)] x 100 ÷ (367a) =	3552.57	x	0.216	=	767.36	(367)
Electrical energy for community heat distribution		31.80	x	0.519	=	16.50	(372)
Total CO2 associated with community systems						783.86	(373)
Total CO2 associated with space and water heating						783.86	(376)
Space cooling		51.92	x	0.519	=	26.95	(377)
Pumps and fans		114.79	x	0.519	=	59.58	(378)
Electricity for lighting		252.20	x	0.519	=	130.89	(379)
Total CO_2, kg/year					(376)..(382) =	1001.27	(383)
Dwelling CO_2 emission rate					(383) ÷ (4) =	18.20	(384)
EI value						86.58	
EI rating (section 14)						87	(385)
EI band						B	

13b. Primary energy - community heating scheme

		Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary energy from other sources (space heating)							
Efficiency of boilers		89.50					(367a)
Primary energy from boilers	[(307a)+(310a)] x 100 ÷ (367a) =	3552.57	x	1.22	=	4334.14	(367)
Electrical energy for community heat distribution		31.80	x	3.07	=	97.61	(372)
Total primary energy associated with community systems						4431.75	(373)
Total primary energy associated with space and water heating						4431.75	(376)
Space cooling		51.92	x	3.07	=	159.39	(377)
Pumps and fans		114.79	x	3.07	=	352.42	(378)
Electricity for lighting		252.20	x	3.07	=	774.26	(379)
Primary energy kWh/year						5717.81	(383)
Dwelling primary energy rate kWh/m2/year						103.96	(384)

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Be clean data sheets

DER Worksheet
Design - Draft

NHER

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Miss Holly Clifton	Assessor number	22160
Client		Last modified	15/11/2019
Address	3 1 E 1, London, NW1 1HG		

1. Overall dwelling dimensions

		Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied		55.00	(1a)	x	2.60	(2a)	=	143.00	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	55.00	(4)						
Dwelling volume							(3a) + (3b) + (3c) + (3d)...(3n) =	143.00	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

				Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)		0.15	(18)
Number of sides on which the dwelling is sheltered		2	(19)
Shelter factor	1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(18) x (20) =	0.13	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	77.35	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(24a)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(25)

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3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Door			1.89	x	1.40	=	2.65			(26)
Window			7.15	x	1.01	=	7.20			(27)
Window			9.31	x	1.10	=	10.24			(27)
Window			2.76	x	1.12	=	3.08			(27)
Window			1.14	x	1.32	=	1.50			(27)
External wall			15.42	x	0.14	=	2.16			(29a)
External wall			39.96	x	0.13	=	5.19			(29a)
Party wall			11.90	x	0.00	=	0.00			(32)
External wall			0.24	x	1.17	=	0.28			(29a)
External wall			0.89	x	1.15	=	1.02			(29a)
External wall			2.15	x	1.39	=	2.99			(29a)
Total area of external elements ∑A, m²			80.91							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	36.32	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		100.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		2.43	(36)
Total fabric heat loss	(33) + (36) =	38.75	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly 0.33 x (25)m x (5)	13.02	12.87	12.71	11.96	11.81	11.06	11.06	10.91	11.36	11.81	12.11	12.41	(38)
Heat transfer coefficient, W/K (37)m + (38)m	51.76	51.61	51.46	50.71	50.56	49.81	49.81	49.66	50.11	50.56	50.86	51.16	
Average = ∑(39)1...12/12 =												50.67	(39)
Heat loss parameter (HLP), W/m²K (39)m ÷ (4)	0.94	0.94	0.94	0.92	0.92	0.91	0.91	0.90	0.91	0.92	0.92	0.93	
Average = ∑(40)1...12/12 =												0.92	(40)
Number of days in month (Table 1a)	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	1.84	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	77.84	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	85.62	82.51	79.39	76.28	73.17	70.05	70.05	73.17	76.28	79.39	82.51	85.62	
∑(44)1...12 =												934.05	(44)
Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)	126.97	111.05	114.60	99.91	95.86	82.72	76.65	87.96	89.01	103.74	113.24	122.97	
∑(45)1...12 =												1224.68	(45)
Distribution loss 0.15 x (45)m	19.05	16.66	17.19	14.99	14.38	12.41	11.50	13.19	13.35	15.56	16.99	18.45	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	1.00	(47)
Water storage loss:		
a) If manufacturer's declared loss factor is known (kWh/day)	0.20	(48)
Temperature factor from Table 2b	1.00	(49)

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Energy lost from water storage (kWh/day) (48) x (49)	0.20	(50)
Enter (50) or (54) in (55)	0.20	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water storage loss calculated for each month (55) x (41)m	6.20	5.60	6.20	6.00	6.20	6.00	6.20	6.20	6.00	6.20	6.00	6.20	(56)
If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)	6.20	5.60	6.20	6.00	6.20	6.00	6.20	6.20	6.00	6.20	6.00	6.20	(57)
Primary circuit loss for each month from Table 3	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for each month from Table 3a, 3b or 3c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m	156.44	137.66	144.06	128.42	125.33	111.23	106.12	117.42	117.53	133.20	141.75	152.43	(62)
Solar DHW input calculated using Appendix G or Appendix H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from water heater for each month (kWh/month) (62)m + (63)m	156.44	137.66	144.06	128.42	125.33	111.23	106.12	117.42	117.53	133.20	141.75	152.43	

∑(64)1...12 = 1571.58 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]	65.79	58.21	61.67	56.03	55.44	50.31	49.06	52.82	52.41	58.06	60.46	64.46	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5)	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87	91.87	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.28	12.68	10.32	7.81	5.84	4.93	5.33	6.92	9.29	11.80	13.77	14.68	(67)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	160.19	161.85	157.66	148.74	137.49	126.91	119.84	118.18	122.36	131.28	142.54	153.12	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.19	32.19	32.19	32.19	32.19	32.19	32.19	32.19	32.19	32.19	32.19	32.19	(69)
Pump and fan gains (Table 5a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (Table 5)	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	-73.49	(71)
Water heating gains (Table 5)	88.43	86.63	82.89	77.82	74.52	69.88	65.94	70.99	72.79	78.04	83.97	86.64	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m	313.45	311.72	301.43	284.93	268.41	252.28	241.66	246.65	255.00	271.68	290.84	304.99	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
NorthEast	0.30	x	2.86	x	11.28	x 0.9 x	0.40	x	0.90	=	3.14	(75)
NorthEast	0.77	x	13.60	x	11.28	x 0.9 x	0.40	x	0.90	=	38.28	(75)
NorthWest	0.77	x	2.76	x	11.28	x 0.9 x	0.40	x	0.90	=	7.77	(81)
SouthEast	0.77	x	1.14	x	36.79	x 0.9 x	0.40	x	1.00	=	11.63	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains in watts ∑(74)m...(82)m	60.81	119.93	207.49	329.83	435.83	461.88	433.15	349.60	249.15	144.25	75.82	50.12	(83)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total gains - internal and solar (73)m + (83)m	374.27	431.65	508.92	614.76	704.24	714.16	674.81	596.25	504.15	415.93	366.66	355.11	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(°C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area n1,m (see Table 9a)	0.95	0.93	0.87	0.75	0.59	0.42	0.32	0.37	0.60	0.83	0.93	0.96	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)	19.22	19.49	19.94	20.46	20.80	20.94	20.98	20.97	20.84	20.36	19.71	19.17	(87)
Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C)	20.13	20.13	20.14	20.15	20.15	20.16	20.16	20.17	20.16	20.15	20.15	20.14	(88)
Utilisation factor for gains for rest of dwelling n2,m	0.94	0.92	0.85	0.72	0.55	0.37	0.26	0.31	0.54	0.80	0.92	0.95	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	17.74	18.13	18.76	19.49	19.93	20.11	20.15	20.15	20.00	19.38	18.46	17.68	(90)

Living area fraction — Living area ÷ (4) = 0.69 (91)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2	18.75	19.06	19.57	20.16	20.52	20.68	20.72	20.71	20.58	20.06	19.31	18.70	(92)
Apply adjustment to the mean internal temperature from Table 4e where appropriate	18.75	19.06	19.57	20.16	20.52	20.68	20.72	20.71	20.58	20.06	19.31	18.70	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm	0.93	0.90	0.84	0.72	0.56	0.41	0.30	0.35	0.57	0.80	0.90	0.94	(94)
Useful gains, ηmGm, W (94)m x (84)m	348.69	389.53	428.38	443.90	396.95	289.72	201.42	208.01	288.01	332.95	331.55	333.54	(95)
Monthly average external temperature from Table U1	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]	748.20	730.86	672.42	570.85	446.10	302.95	205.26	214.14	324.65	478.05	621.21	742.01	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m	297.24	229.37	181.57	91.40	36.57	0.00	0.00	0.00	0.00	107.95	208.56	303.90	

∑(98)1...5, 10...12 = 1456.56 (98)

Space heating requirement kWh/m²/year — (98) ÷ (4) 26.48 (99)

8c. Space cooling requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm	0.00	0.00	0.00	0.00	0.00	468.18	368.57	377.38	0.00	0.00	0.00	0.00	(100)
Utilisation factor for loss ηm	0.00	0.00	0.00	0.00	0.00	0.93	0.96	0.94	0.00	0.00	0.00	0.00	(101)
Useful loss ηmLm (watts) (100)m x (101)m	0.00	0.00	0.00	0.00	0.00	435.91	352.15	354.11	0.00	0.00	0.00	0.00	(102)
Gains	0.00	0.00	0.00	0.00	0.00	909.56	861.61	767.97	0.00	0.00	0.00	0.00	(103)
Space cooling requirement, whole dwelling, continuous (kWh) 0.024 x [(103)m - (102)m] x (41)m	0.00	0.00	0.00	0.00	0.00	341.03	379.04	307.91	0.00	0.00	0.00	0.00	

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	∑(104)6...8 =	1027.98	(104)
Cooled fraction	cooled area ÷ (4) =	0.82	(105)
Intermittency factor (Table 10)			

0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.25	0.00	0.00	0.00	0.00

	∑(106)6...8 =	0.75	(106)
Space cooling requirement (104)m x (105) x (106)m			

0.00	0.00	0.00	0.00	0.00	69.76	77.53	62.98	0.00	0.00	0.00	0.00

	∑(107)6...8 =	210.27	(107)
Space cooling requirement kWh/m²/year	(107) ÷ (4) =	3.82	(108)

9b. Energy requirements - community heating scheme

Fraction of space heat from secondary/supplementary system (table 11)		'0' if none	0.00	(301)
Fraction of space heat from community system		1 - (301) =	1.00	(302)
Fraction of community heat from boilers			0.25	(303a)
Fraction of community heat from CHP			0.75	(303b)
Fraction of total space heat from community CHP		(302) x (303a) =	0.75	(304a)
Fraction of total space heat from community boilers		(302) x (303b) =	0.25	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating			1.00	(305a)
Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heating				
Annual space heating requirement	1456.56			(98)
Space heat from CHP		(98) x (304a) x (305) x (306) =	1147.04	(307a)
Space heat from boilers		(98) x (304b) x (305) x (306) =	382.35	(307b)
Water heating				
Annual water heating requirement	1571.58			(64)
Water heat from CHP		(64) x (303a) x (305a) x (306) =	1237.62	(310a)
Water heat from boilers		(64) x (303b) x (305a) x (306) =	412.54	(310b)
Electricity used for heat distribution		0.01 × [(307a)...(307e) + (310a)...(310e)] =	31.80	(313)
Cooling System Energy Efficiency Ratio			4.05	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)		(107) ÷ (314)	51.92	(315)
Electricity for pumps, fans and electric keep-hot (Table 4f)				
mechanical ventilation fans - balanced, extract or positive input from outside	114.79			(330a)
Total electricity for the above, kWh/year			114.79	(331)
Electricity for lighting (Appendix L)			252.20	(332)
Total delivered energy for all uses		(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =	3598.46	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from CHP	1147.04	x	2.97	x 0.01 =	34.07	(340a)
Space heating from boilers	382.35	x	4.24	x 0.01 =	16.21	(340b)
Water heating from CHP	1237.62	x	2.97	x 0.01 =	36.76	(342a)
Water heating from boilers	412.54	x	4.24	x 0.01 =	17.49	(342b)
Space cooling	51.92	x	13.19	x 0.01 =	6.85	(348)
Pumps and fans	114.79	x	13.19	x 0.01 =	15.14	(349)

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Electricity for lighting	252.20	x	13.19	x 0.01 =	33.27	(350)
Additional standing charges					120.00	(351)
Total energy cost				(340a)...(342e) + (345)...(354) =	279.78	(355)

11b. SAP rating - community heating scheme

Energy cost deflator (Table 12)	0.42	(356)
Energy cost factor (ECF)	1.18	(357)
SAP value	83.61	
SAP rating (section 13)	84	(358)
SAP band	B	

12b. CO_2 emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from community CHP (space and water heating)							
Power efficiency of CHP unit		41.75					(361)
Heat efficiency of CHP unit		44.25					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	2592.0476	x	0.2160	=	559.8823	(363)
less credit emissions for electricity		-1082.1170	x	0.5190	=	-561.6187	(364)
Water heated by CHP		2796.7256	x	0.2160	=	604.0927	(365)
less credit emissions for electricity		-1167.5651	x	0.5190	=	-605.9663	(366)
Emissions from other sources (space heating)							
Efficiency of boilers		89.50					(367b)
CO2 emissions from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	888.14	x	0.216	=	191.84	(368)
Electrical energy for community heat distribution		31.80	x	0.519	=	16.50	(372)
Total CO2 associated with community systems						204.73	(373)
Total CO2 associated with space and water heating						204.73	(376)
Space cooling		51.92	x	0.519	=	26.95	(377)
Pumps and fans		114.79	x	0.519	=	59.58	(378)
Electricity for lighting		252.20	x	0.519	=	130.89	(379)
Total CO_2, kg/year					(376)..(382) =	422.15	(383)
Dwelling CO_2 emission rate					(383) ÷ (4) =	7.68	(384)
EI value						94.34	
EI rating (section 14)						94	(385)
EI band						A	

13b. Primary energy - community heating scheme

		Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary Energy from community CHP (space and water heating)							
Power efficiency of CHP unit		41.75					(361)
Heat efficiency of CHP unit		44.25					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	2592.05	x	1.22	=	3162.30	(363)
less credit energy for electricity		-1082.12	x	3.07	=	-3322.10	(364)
Water heated by CHP		2796.73	x	1.22	=	3412.01	(365)
less credit energy for electricity		-1167.57	x	3.07	=	-3584.42	(366)
Primary energy from other sources (space heating)							
Efficiency of boilers		89.50					(367b)
Primary energy from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	888.14	x	1.22	=	1083.53	(368)

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Appendix B: Correspondence with Central Somers Town District Energy Operator (Vital Energy / Camden Council)

Wed 13/11/2019 14:29

DJ Davies, James <James.Davies@camden.gov.uk>

RE: Central Somers Town energy centre

To Louise Wille

Cc Lena Kotina; Zygi Kadziulis; Michelle Wang

Retention Policy RPT-Default-Inbox (1 year, 6 months) Expires 13/05/2021

You forwarded this message on 14/11/2019 13:24.

D1. JMS412 (103-80) - 170919.pdf
143 KB

[External email]

Hi Louise,

All the information is still correct. The heat to power ration is 1.06 but data sheet for the engine is attached. This also contains the efficiency data I shared previously.

Cheers,

James

James Davies
Sustainability Projects Manager

Telephone: 020 7974 6892

From: Louise Wille
Sent: 12 November 2019 18:10
To: 'james.Davies@camden.gov.uk' <james.Davies@camden.gov.uk>
Cc: Lena Kotina <LenaKotina@hoarelea.com>; Zygi Kadziulis <ZygiKadziulis@hoarelea.com>; Michelle Wang <MichelleWang@hoarelea.com>
Subject: Central Somers Town energy centre
Importance: High

Dear James,

Zygi forwarded me your details. Tony at Vital Energy tells me you're the man to contact regarding the Central Somers Town energy centre?

I am working with Zygi and Lena on the Brill Place tower, and as you will be aware, the plan is to connect the building to the energy centre for the entire heating and hot water demand. I have previously received some information regarding the installation which I was hoping to double check with you:

Could you please provide us with a confirmation of the **heat to power ratio** of the CHP? I expect this will be around 1.05, based on the percentage efficiency of heating and electricity given before (in the attached), I just wanted to double-check as these inputs impact our results greatly.

If there are any other figures given in the attached that would need updating we would be grateful for this also.

We are expecting to submit the application imminently, therefore a swift response would be much appreciated. Apologies for the short notice, it has taken me a few days and some running around in circles to get to your contact details!

Best regards,
Louise

Louise Wille
Principal Sustainability Consultant

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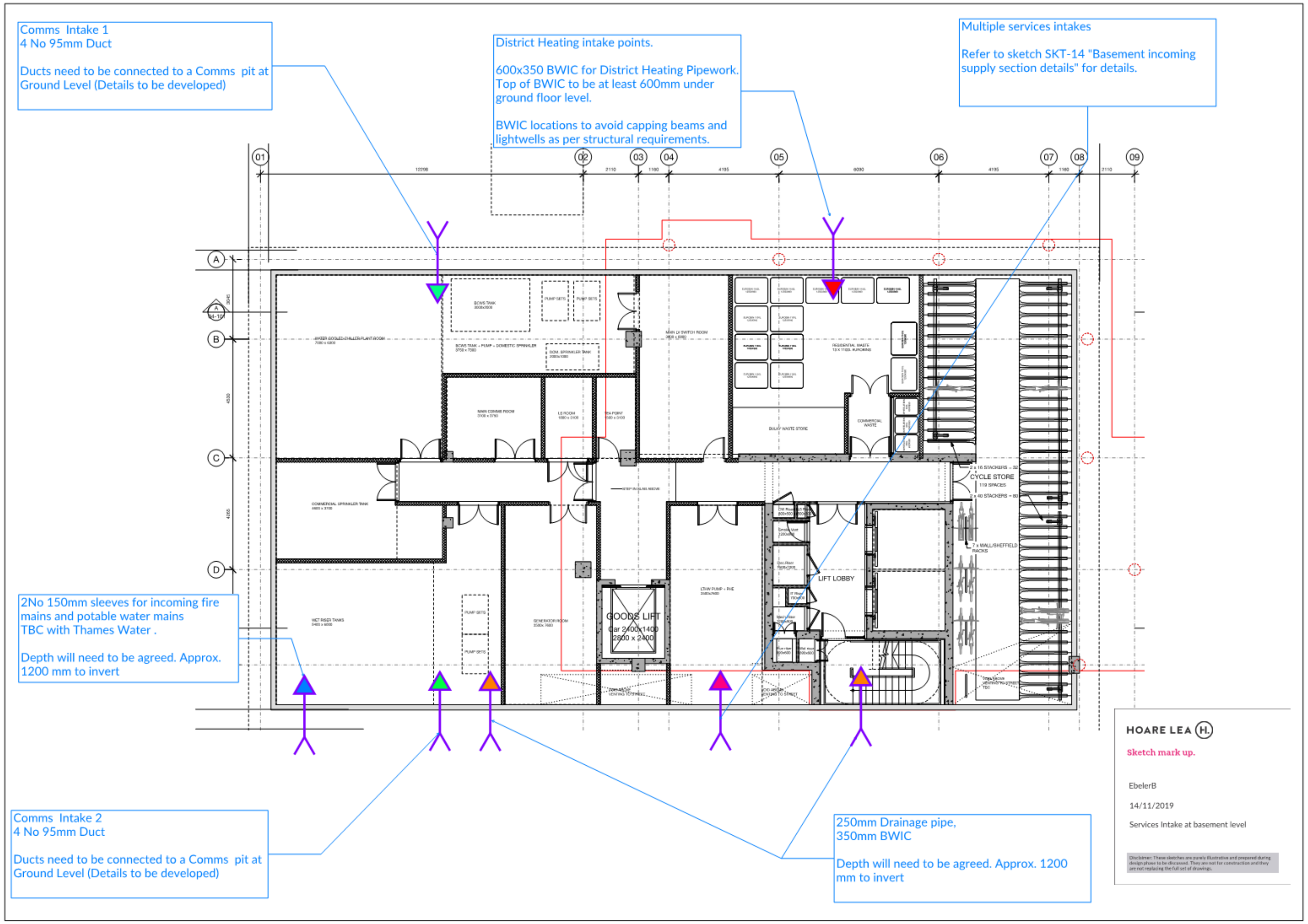
Mob +44 7854 104 390
Email louisewille@hoarelea.com

Appendix C: Proposed basement plan sketch, showing connection to incoming DEN Network



Appendix D: GLA Overheating Checklist

Section 1 – Site Features affecting vulnerability to overheating		Please respond Yes or No
Site Location	Urban – within central London or high density conurbation	No
	Peri-urban – on the suburban fringes of London	Yes
Air Quality and/or Noise sensitivity – are any of the following in the vicinity of buildings?	Busy roads / A roads	Yes
	Railways / Overground / DLR	Yes
	Airport / Flight Path	TBC
	Industrial uses / waste facility	TBC
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	YES
	Are residents likely to be at home during the day (e.g. students)?	TBC
Dwelling aspect	Are there any single aspect units?	Yes
Glazing ratio	Is the glazing ratio (glazing : internal floor area) greater than 25%?	TBC
	If yes, is this to allow acceptable levels of daylighting?	TBC
Security – Are there any security issues that could limit opening of windows for ventilation?	Single storey ground floor units	Residential Lobby & Commercial Unit Only
	Vulnerable areas identified by the Police Architectural Liaison Officer	No
	Other	N/A

Table 17: GLA Overheating Checklist – Section 1

Section 2 – Design Features Implemented to Mitigate Overheating Risk		Please Respond
Landscaping	Will deciduous trees be provided for summer shading (to windows and pedestrian routes)?	Yes
	Will green roofs be provided?	No
	Will other green or blue infrastructure be provided around buildings for evaporative cooling?	Yes (Building located within Purchese St Open Space (Park))
Materials	Have high albedo (light colour) materials been specified?	Natural anodised aluminium to flag elevation
Dwelling Aspect	% of total units that are single aspect	0%
	% of single aspect with N/NE/NW orientation	0%

Section 2 – Design Features Implemented to Mitigate Overheating Risk		Please Respond
	% single aspect with E orientation	0%
	% single aspect with S/SE/SW orientation	0%
	% single aspect with W orientation	0%
Glazing Ratio – What is the glazing ratio (glazing: internal floor area) on each façade?	N/NE/NW	Please refer to the Design and Access Statement submitted in support of this planning application for detailed information regarding floor areas and elevations.
	E	
	S/SE/SW	
	W	
Daylighting	What is the average daylight factor range	TBC
Window Opening	Are windows openable?	Yes
	What is the average percentage of openable area for the windows?	100% (side hung 90 degree internally opening)
Window Opening – what is the extent of the opening?	Fully openable	Yes (part)
	Limited (e.g. for security, safety, wind loading reasons)	Yes (part)
Security	Where there are security issues (e.g. ground floor flats) has an alternative night time natural ventilation method been provided (e.g. ventilation grates)?	N/A no ground floor apartments proposed
Shading	Is there any external shading?	Yes
	Is there any internal shading?	Blinds / curtains
Glazing Specification	Is there any solar control glazing?	Yes – g-value of 0.4 throughout
Ventilation – what is the ventilation strategy?	Natural - background	No
	Natural – purge	Yes
	Mechanical – background (e.g. MVHR)	Yes
	Mechanical – purge	No
	What is the average design air change rate?	In line with part F requirements
Heating System	Is communal heating present?	Yes
	What is the flow/return temperature?	85/65
	Have horizontal pipe runs been minimized?	Yes
	Do the specifications include insulation levels in line with the London Heat Network Manual?	Yes

Table 18: GLA Overheating Checklist – Section 2

Appendix E: CHP data sheet (select pages)

Technical Description

Cogeneration Unit
JMS 412 GS-N.L

dyn. GC Profile 1 (150ms/30%)

Somers Town Energy

Electrical output	901 kW el.
Thermal output	957 kW

Emission **values**
NOx < 250 mg/Nm³ (5% O2)

0.01 Technical Data (at module)

			100%	75%	50%
Energy input	[2]	kW	2.169	1.671	1.173
Gas volume	*)	Nm³/h	228	176	123
Mechanical output	[1]	kW	928	696	464
Electrical output	[4]	kW el.	901	675	448
Recoverable thermal output					
~ Intercooler 1st stage	[9]	kW	186	91	26
~ Lube oil		kW	126	112	94
~ Jacket water		kW	247	224	188
~ Exhaust gas cooled to 123 °C		kW	398	330	250
Total recoverable thermal output	[5]	kW	957	758	558
Total output generated		kW total	1.858	1.433	1.006
Heat to be dissipated					
~ Intercooler 2nd stage		kW	97	77	53
~ Lube oil		kW	~	~	~
~ Surface heat	ca. [7]	kW	79	~	~
Spec. fuel consumption of engine electric	[2]	kWh/kWel.h	2,41	2,47	2,62
Spec. fuel consumption of engine	[2]	kWh/kWh	2,34	2,40	2,53
Lube oil consumption	ca. [3]	kg/h	0,19	~	~
Electrical efficiency			41,5%	40,4%	38,2%
Thermal efficiency			44,1%	45,3%	47,6%
Total efficiency	[6]		85,7%	85,8%	85,8%
Hot water circuit:					
Forward temperature		°C	103,0	98,2	93,4
Return temperature		°C	80,0	80,0	80,0
Hot water flow rate		m³/h	35,7	35,7	35,7
Fuel gas LHV		kWh/Nm³	9,5		

*) approximate value for pipework dimensioning
[_] Explanations: see 0.10 - Technical parameters

All heat data is based on standard conditions according to attachment 0.10. Deviations from the standard conditions can result in a change of values within the heat balance, and must be taken into consideration in the layout of the cooling circuit/equipment (intercooler; emergency cooling; ...). In the specifications in addition to the general tolerance of ±8 % on the thermal output a further reserve of +5 % is recommended for the dimensioning of the cooling requirements.

Appendix F: Typical thermal mass for illustrative constructions (source: SAP conventions)

Table 2: Thermal mass parameter for whole dwelling

The following provides the thermal mass for some illustrative constructions.

Thermal mass of elements				Illustrative construction	Indicative Thermal Mass
Ground floor	**External walls**	**Party wall**	**Internal partitions**		
Low	Low	Low	Low	Suspended timber floor, carpeted Timber frame external wall Timber frame party wall Partitions: plasterboard on timber frame	Low
Medium	Low	Low	Low	Suspended concrete floor, carpeted Timber frame external wall Timber frame party wall Partitions: plasterboard on timber frame	Low
Medium	Medium	Low	Low	Suspended concrete floor, carpeted Masonry cavity wall – AAC block, filled cavity Timber frame party wall Partitions: plasterboard on timber frame	Low
Medium	Medium	Medium	Low	Suspended concrete floor, carpeted Masonry cavity wall – AAC block, filled cavity AAC party wall Partitions: plasterboard on timber frame.	Medium
Medium	Medium	Medium	Medium	Suspended concrete floor, carpeted Masonry cavity wall – AAC block, filled cavity AAC party wall Partitions: medium block, plasterboard on dabs	Medium
High	Medium	Medium	Medium	Slab on ground, carpeted Masonry cavity wall – AAC block, filled cavity AAC party wall Partitions: dense block, plasterboard on dabs	Medium
High	High	Medium	Medium	Slab on ground, carpeted Masonry cavity wall – dense block, filled cavity AAC party wall Partitions: medium block, plasterboard on dabs	Medium
High	High	High	Medium	Slab on ground, carpeted Masonry cavity wall – dense block, filled cavity Dense block party wall Partitions: medium block, plasterboard on dabs	High
High	High	High	High	Slab on ground, carpeted Masonry cavity wall – dense block, filled cavity Dense block party wall Partitions: dense block, dense plaster	High

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