10-22 CANFIELD PLACE

OVERHEATING ASSESSMENT

MARCH 2017

10-22 CANFIELD PLACE

OVERHEATING ASSESSMENT

Imperial Resources Limited

Project no: 70030628
Date: March 2017

WSP | Parsons Brinckerhoff
6 Devonshire Square
London, EC2M 4YE

Tel: +44 207 337 1700
Fax: +44 207 337 1701
www.wsp-pb.co.uk

QUALITY MANAGEMENT

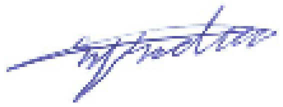
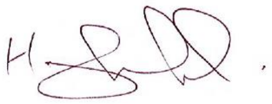
ISSUE/REVISION	DRAFT	
Remarks		
Date	14/03/2017	
Prepared by	Sabbir Sidat	
Signature		
Checked by	Harry Knibb	
Signature		
Authorised by	Barny Evans	
Signature		
Project number	March 2017	

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

1.1.1 WSP | Parsons Brinckerhoff have been appointed by Imperial Resources Limited to provide an Overheating Assessment report to support the planning application of the proposed houses at 10-22 Canfield Place in-line with both the GLA and Camden Council requirements.

1.1.2 The aim of the Overheating Assessment analysis is to evaluate overheating risk in bedrooms and living areas in line with GLA guidance originally released in April 2015 and revised in March 2016 (Energy Planning, GLA Guidance on preparing energy assessments), and, if necessary, to identify mitigating measures.

1.1.3 Assessing all of the units would be unduly onerous and therefore, three townhouses have been modelled; these are broadly representative of the different unit types and risk of overheating.

1.1.4 The analysis has been carried out on House Type D, C1 and B1 using plans and elevations received, accepted as the final design. House Type D is and end terrace and so judged as being at most risk of overheating. House Types C1 and B1 represent two and three floor designs.

1.1.5 The units were first modelled using the current design summer year (1989) weather files for London in line with GLA Policy and assessed based on CIBSE TM52 overheating criteria. Following this the TM49 CIBSE design summer years for London were applied (1976 and 2003). These take account of the urban heat island effect and represent high temperature events of varying severity. Assessing overheating risk based on this data is recommended by the GLA for energy strategies as it can allow an assessment of risks over the long term in an uncertain climate.

1.1.6 Current industry good practice is to use the 1989 weather file with a 2020 climate change uplift factor applied. Therefore this has also been modelled.

1.1.7 Our approach follows the cooling hierarchy through the use of energy efficient design to reduce heat building up through glazing specifications, bris solei, openable roof level doors, solar blinds, and finally mechanical cooling.

1.1.8 This assessment shows that under Criterion 1 of CIBSE guide TM52 no habitable rooms overheat in the baseline year (DSY1) or in the 2020 high emission scenario. However when examined under the additional requirements for the bedrooms, the rooms were shown to overheat and therefore would disturb sleep.

1.1.9 When assessed against more extreme years, rooms with a high level of glazing may also suffer from overheating under Criteria 1 of TM52.

1.1.10 Air source heat pumps will provide space heating and hot water and will provide cooling if required.

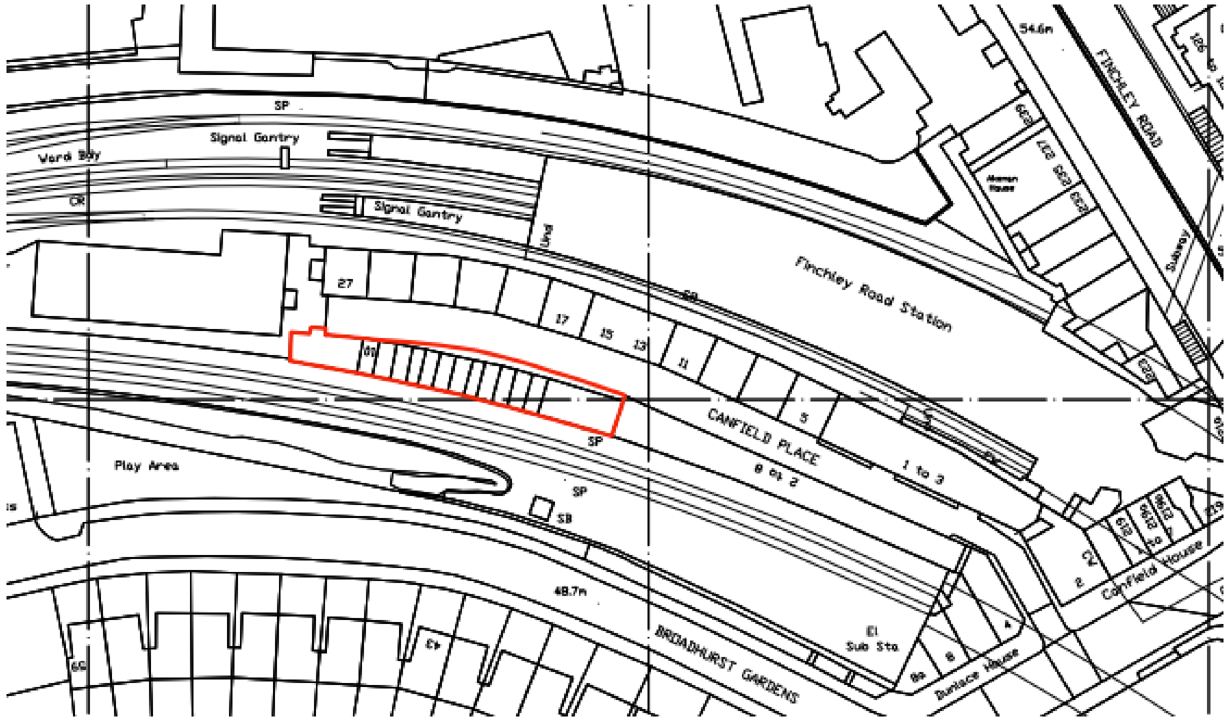
2 PROJECT BACKGROUND

2.1 DEVELOPMENT DESCRIPTION

2.1.1 WSP | Parsons Brinckerhoff have been appointed by Imperial Resources Limited to provide an Overheating Assessment report to support the planning application of the proposed eight houses to be constructed in the London Borough of Camden.

2.1.2 The aim of the analysis is to evaluate overheating risk in bedrooms and living areas in line with GLA guidance originally released in April 2015 and updated in March 2016 (Energy Planning, GLA Guidance on preparing energy assessments), and, where necessary, to identify mitigating measures.

Figure 1 Site Location



2.1.3 Canfield Place is a new residential mews development located between Finchley Road Tube Station to the north and the Chiltern Railway tracks to the south. It involves demolition of 16 single storey garages and redevelopment of the site to provide 8 mews type residential dwellings (C3) comprising of the following:

- 2No. 2 storey mid-terrace houses with roof gardens
- 5No. 3 storey mid-terrace houses with roof gardens
- 1No. 2 storey end-terrace houses with garage

2.1.4 The dwellings are to be serviced by air-to-water heat pumps and mechanical ventilation and heat recovery. The building specification used in this analysis for main fabric elements are shown in Appendix A.

Figure 2 10-22 Canfield Place Visualisation

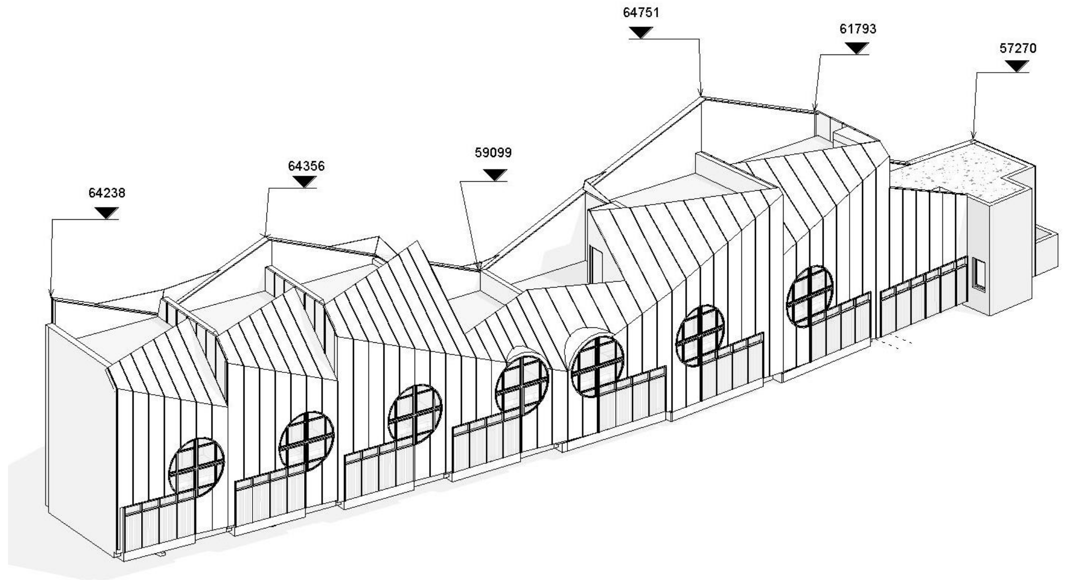


Figure 3 Proposed Site Plan

3 DWELLING OVERHEATING MODELLING

3.1 LONDON PLAN (POLICY 5.9)

3.1.1 Policy 5.9 of the London Plan requires development proposals to reduce potential overheating and reliance on air conditioning systems and demonstrate this is 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 orientation, shading, albedo, 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.

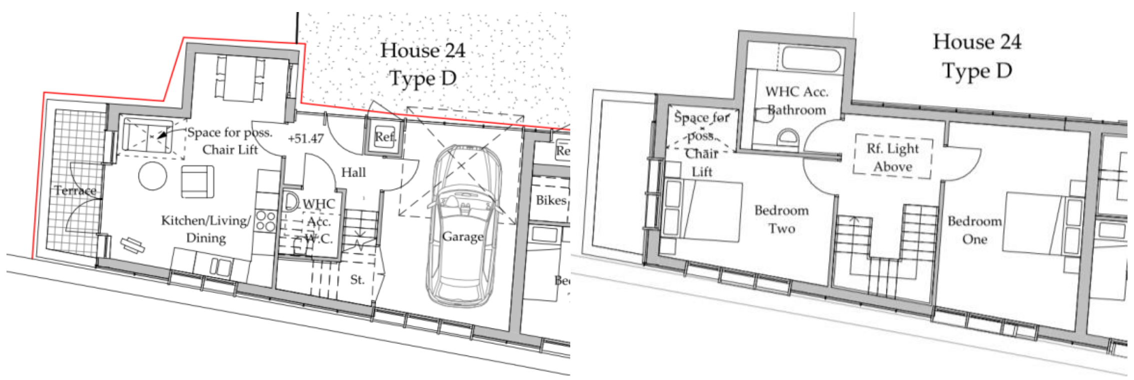
3.2 OVERHEATING ANALYSIS

3.2.1 WSP|PB utilised a dynamic simulation software package, the Virtual Environment (VE) suite from Integrated Environmental Solutions (IES) to assess overheating. This is a fully validated, commercially available software package that is available for the purpose of demonstrating compliance with the Building Regulations. IES <VE> is an integrated suite of applications based around a 3D geometrical model.

3.2.2 An overheating analysis was carried out on an end-block unit (Type D) as shown below in Figure 4. The end terrace unit has the most south/west facing glazing, increasing their risk of overheating compared to the mid-terrace properties.

3.2.3 The occupied rooms for this unit include the ground floor kitchen / living / dining area and the two first floor bedrooms (three rooms in total).

Figure 4 Type D two-storey house



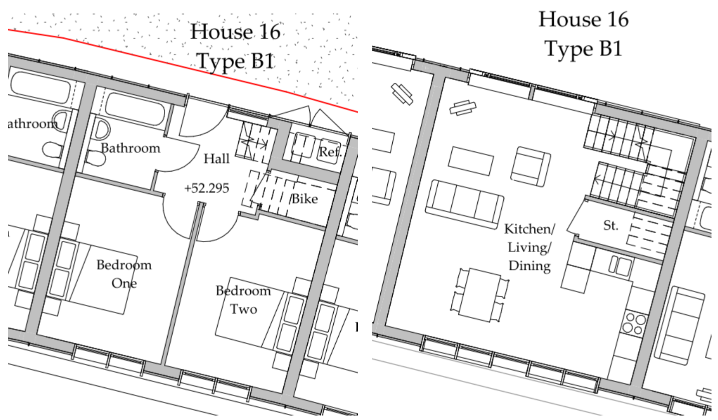
3.2.4 An overheating analysis was also carried out on units which was more representative of the majority of the homes being built (Type C1 and B1) as shown below in Figure 5.

3.2.5 The occupied rooms for unit C1 include the two ground floor bedrooms, first floor bedroom and living room and second floor kitchen / living / dining area (five rooms in total).

3.2.6 The occupied rooms for the B1 unit include the two ground floor bedrooms, first floor kitchen / living / dining area (3 rooms in total).

Figure 5 Type C1 three-storey house

Figure 6 Type B1 two-storey house



3.2.7 The aim of the analysis is to evaluate the internal temperatures in living areas and bedrooms to assess the potential for overheating, in line with the requirements of the GLA. The units modelled were simulated based on current 'design summer year' (DSY) weather tapes for London and the CIBSE Guide TM52 overheating criteria were applied to determine the level of thermal comfort.

3.2.8 Further modelling analysis was undertaken considering future climate change projections following the guidance contained within CIBSE TM49 and a comparison of how the performance of the building against the criteria contained within CIBSE TM52.

3.3 CIBSE TM52 OVERHEATING CRITERIA

3.3.1 CIBSE TM52 sets out criteria based on an adaptive approach to thermal comfort. The 'adaptive' approach to thermal comfort shows that the temperature at which the majority of people are comfortable 'tracks' the mean indoor temperature.

3.3.2 The following three criteria, taken together, provide an assessment of the risk of overheating of buildings in the UK and Europe. A room or building that fails any two of the following three criteria is classed as at risk of overheating.

1. The first criterion states the number of hours (He) during which ∆T (the difference between the actual operative temperature in a room and the limiting maximum acceptable air temperature) is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 percent of occupied hours.
2. The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability. To allow for the severity of overheating the weighted exceedance (We) shall be less than or equal to 6.
3. The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable. The value of ∆T shall not exceed 4˚K.

3.3.3 This analysis only covers the habitable rooms in the house, i.e. the lounges and bedrooms

3.4 CIBSE TM49 DESIGN SUMMER YEARS

3.4.1 This analysis has taken into account three different historical design years for London as identified in CIBSE TM49. These are the following:

- 1989 – This is the current Design Summer Year (DSY) and represents a moderately warm summer, as is interpreted in current CIBSE guidance.
- 1976 – This is a more extreme year with a long period of persistent warmth in the summer.
- 2003 – This is a more extreme year but characterised by a more intense single warm spell.

3.4.2 Hourly weather data files containing the full set of weather variables required for building dynamic thermal simulation were used for these years.

3.4.3 Current industry good practice also suggests the use of the 2020 London Weather Centre 1989 Design Summer Year weather file for high emission scenario 50%; this has also been modelled.

3.5 CIBSE DRAFT GUIDANCE

3.5.1 CIBSE are currently in the process of drafting their methodology for the assessment of overheating in homes. While this is yet to be published, it is deemed that the draft document represents best practice at this point in time.

3.5.2 This methodology aims to:

1. Allow different designs to be compared with a common approach based on reasonable assumptions.
2. Support design decisions that improve comfort without cooling.
3. Provide consistency across the industry as all consultants will be using the same methodology for overheating risk prediction.

3.5.3 This methodology does not:

1. Guarantee that people will always be comfortable, however they act.
2. Take into account unusual use.

3.5.4 Compliance is based on passing BOTH of the following 2 criteria:

- TM52 Criterion 1 must pass (Operative temperature cannot exceed the upper comfort limit for more than 3% of the occupied summer hours). For this analysis category II is assumed.
- Bedrooms only - An additional requirement must be checked for the bedrooms to guarantee comfort during the sleeping hours. The resultant temperature in the bedroom from 10pm to 7am cannot exceed 26°C for more than 1%of hours. (1% of hours between 2200-0700 for bedrooms is 32 hours).

3.6 MODELLING ASSUMPTIONS

3.6.1 For the purposes of this analysis the following key assumptions have been made (in line with the draft guidance:

- The Railway Side windows are assumed to be unopenable for cooling purposes, all other windows can be opened for cooling, as can roof windows and terrace doors for roof access.
- Windows are modelled as being open when the internal dry bulb temperature exceeds 22ºC.
- Windows have been assumed as having external fins protruding 500mm from the window panes.
- Windows have been assumed to include internal blinds. Dwelling benefits from internal linen blinds, which are considered to be closed for assessing overheating risk (a shading coefficient of 0.4 and short wave radiant fraction of 0.3 is assumed in line with BRE guidance).
- Mechanical Ventilation and Heat Recovery (MVHR) have been included in all houses.
- Living spaces and kitchens are assumed to be partially occupied during the morning period between 10am and 10pm and in the evening period between 4pm and 11pm and bedrooms are assumed to be always occupied (in order to consider worst case scenarios).
- Occupancy, lighting and equipment gains have been modelled as per the guidance.
- The building orientation is as per the site plan.

3.7 WINDOW OPENINGS

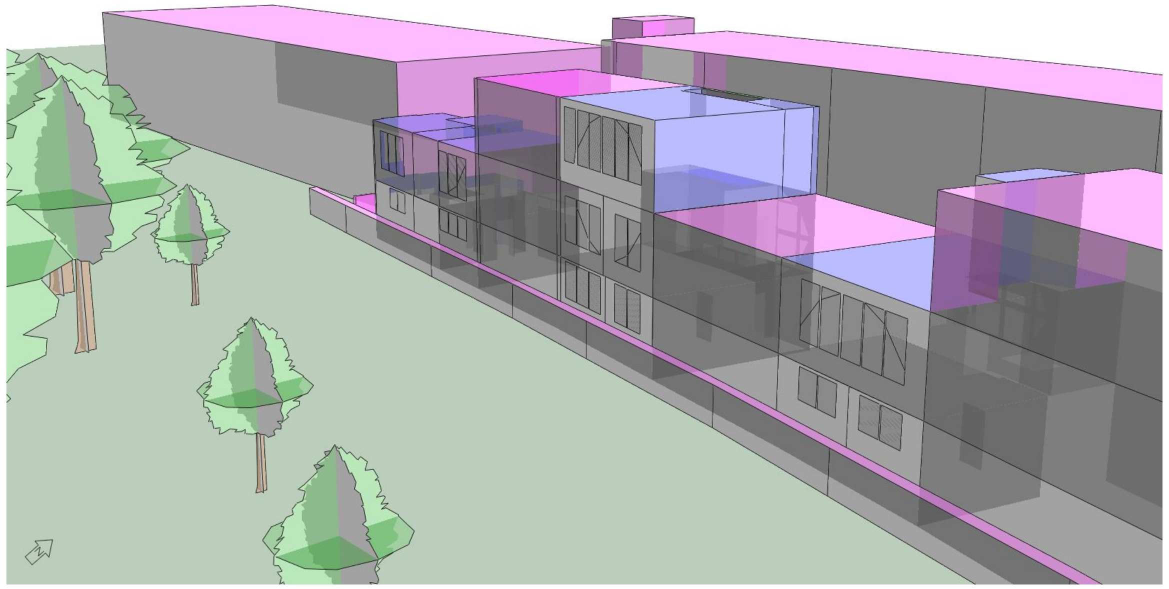
3.7.1 The specifications of the windows for the units have yet to be finalised, however it has been assumed that the south facing windows will include solar control glazing as per the table below. The ‘U’ value is a measure of thermal transmittance. The ‘G’ value is a measure of the complete spectrum of radiant energy through the window.

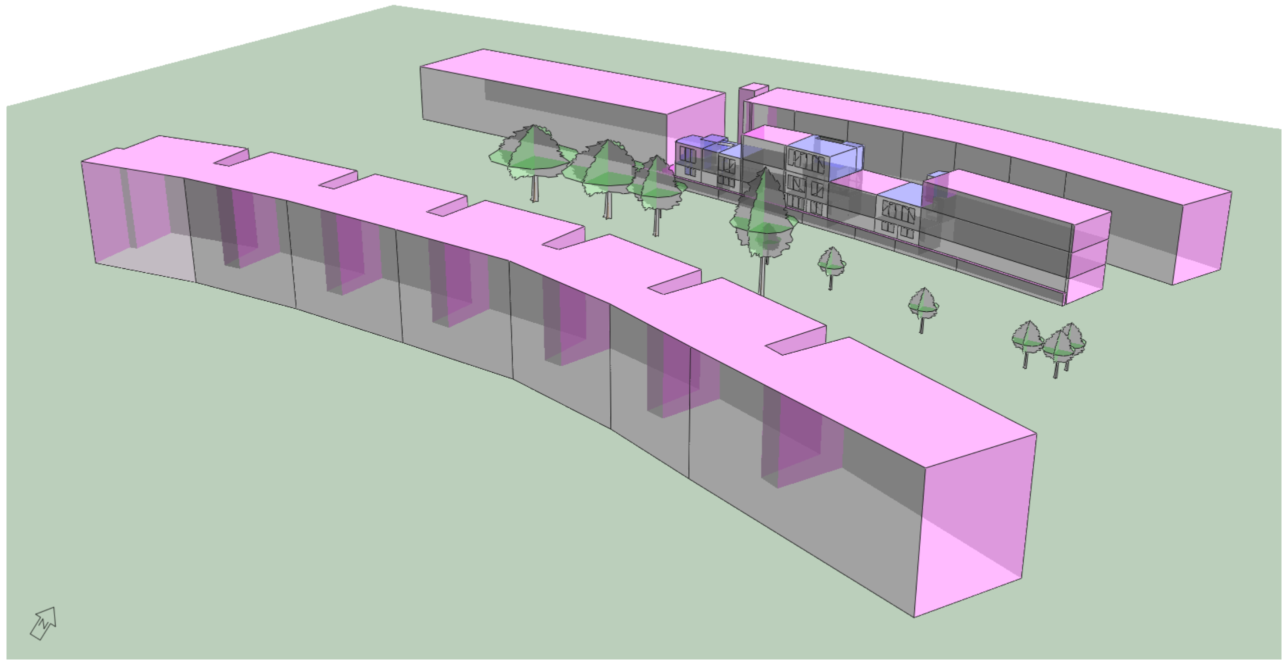
Table 1 Glazing specification

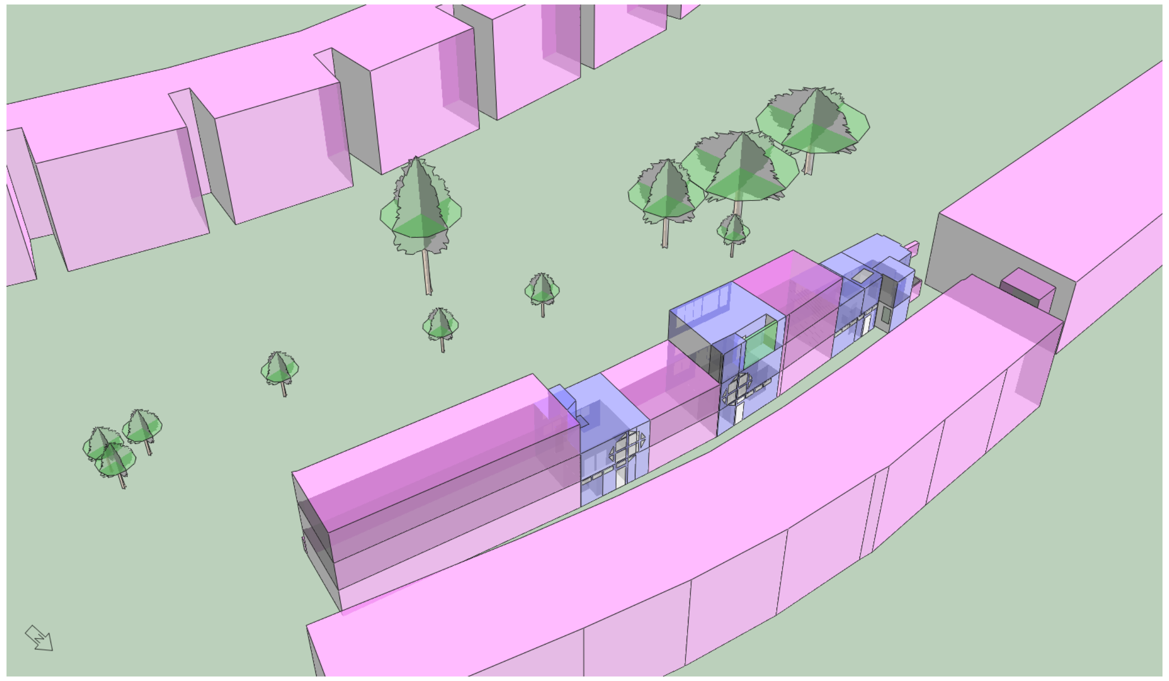
TYPE	‘U’ VALUE	‘G’ VALUE	LIGHT TRANSMITTANCE VALUE
Solar Control Windows	1.20	0.35	0.65
All other Windows	1.20	0.4	0.71

3.7.2 Further information on the specifications and assumptions can be found in the appendix.

Figure 6 IES VE model of units







3.8 SUMMARY OF MEASURES

In accordance with GLA requirements, outlined below are the measures considered at this stage to show compliance with the cooling hierarchy.

Table 2 Cooling Hierarchy

COOLING HIERARCHY STAGE	MEASURES CONSIDERED
1 - Energy efficient design	▪ Highly efficient building fabric and air tightness standards. ▪ For more information see '*Energy Strategy'*
2 - Reduce the amount of heat entering the building	▪ High performing glass on the southern façade with G-values of 0.35. ▪ Enlarged Bris Solei with 500mm deep fins.
3 - Manage the heat	▪ Structural specification is yet to be confirmed at this stage.
4 - Passive measures	▪ All windows and roof and terrace doors assumed to be openable except for those in the southern facade
5 - Mechanical measures	▪ All units benefit from MVHR systems. ▪ For more information see '*Energy Strategy'*
6 - Active cooling	▪ To be considered to the bedrooms as a minimum, see section 4 below.

4 DWELLING OVERHEATING RESULTS

4.1 RESULTS

4.1.1 With no cooling technologies employed or changes to the external facade, none of the rooms are shown to overheat when assessed against the standard design summer year (1989) as well as the 2020 summer year which takes into account climate change.

4.1.2 When the design is tested against the more extreme TM49 dataset (1976 and 2003) overheating is shown to occur in only 1 of the habitable rooms for house type C1 namely the first floor bedroom. This is most likely due to the high levels of glazing.

4.1.3 A summary of the analyses undertaken for the four design years are provided in the table below.

Table 2 Summary of overheating analysis results, number of failures

YEAR	TM52 CRITERIA 1	BEDROOMS REQUIREMENT
1989 – baseline year	0 (of 11)	0 (of 7)
1976 – sustained summer	1 (of 11)	6 (of 7)
2003 – short hot summer	1 (of 11)	6 (of 7)
1989 – (2020 high emissions scenario, 50th percentile)	0 (of 11)	5 (of 7)

4.1.4 In order to meet the requirements as set out in the CIBSE draft guidance, the development must meet the limits of both Criteria 1 of TM52 as well as an additional requirement in the bedrooms; this is for the Design Summer Year 1 (1989), 2020 high emission scenario.

4.1.5 As shown in the table above this development, without the use of mechanical cooling, has not met this requirement. Therefore it is recommended that the air source heat pumps specified should be selected to also provide mechanical cooling to the housing units, or as a minimum to the bedrooms for use in extreme events.

4.2 CONCLUSIONS

4.2.1 This assessment shows that under Criteria 1 of CIBSE guide TM52 no habitable rooms overheat in the baseline year (DSY1) or in the 2020 high emission scenario. However when examined under the additional requirements for the bedrooms, the rooms were shown to overheat and therefore would disturb sleep.

4.2.2 When assessed against more extreme years, rooms with a high level of glazing may also suffer from overheating under Criteria 1 of TM52.

4.2.3 Mechanical cooling will be installed in order to ensure user comfort is maintained, as per the requirements of the cooling hierarchy.

APPENDIX A – SPECIFICATION / ASSUMPTIONS

BUILDING FABRIC

Specification	Value
External Wall - U Value (W/m².K)	0.16
Roof - U Value (W/m².K)	0.11
Floors - U Value (W/m².K)	0.11
Party Walls - U Value (W/m².K)	0.00
Windows - U Value (W/m².K)	1.20
Window - Visible Light Transmittance	0.71
Window – G Value	0.40
South Control Windows - U Value (W/m².K)	1.20
South Control Window - Visible Light Transmittance	0.65
South Control Window – G value	0.35
Blind Shading Coefficient	0.40
Blind Short-Wave Radiant Fraction	0.30

OPENING TYPES

Name	Parameters	Value
External Windows – Non Openable	Type	Top Hung
	Openable Area	0%
	Max Angle Open	20º
External Windows – Openable	Type	Bottom Hung
	Openable Area	90%
	Max Angle Open	20º
Internal Doors	Type	Door
	Openable Area	90%
	Max Angle Open	90º
Terrace Doors	Type	Door
	Openable Area	90%
	Max Angle Open	90º

MVHR DETAILS – REQUIREMENT 1

Room	Continuous Extract – Min High Rate
Extract Ventilation Rates - Kitchen	13 l/s continuous
Extract Ventilation Rates - Bathroom	8 l/s continuous
Extract Ventilation Rates - Utility	8 l/s continuous
House	**Continuous Extract – Min High Rate Total**
B1	21 l/s continuous
C1	29 l/s continuous
D	27 l/s continuous

MVHR DETAILS – REQUIREMENT 2

No. of Bedrooms	Whole Dwelling Ventilation Rates
Two Bedrooms	17 l/s continuous
Three Bedrooms	21 l/s continuous
Additional Occupants	+ 4 l/s continuous
House	**Continuous Extract – Min High Rate Total**
B1	17 l/s continuous
C1	25 l/s continuous
D	21 l/s continuous

MVHR DETAILS – REQUIREMENT 3 (APPLICABLE)

Rate	Whole Dwelling Ventilation Rates
Minimum Rate	0.3 l/s/m² continuous
House	**Continuous Extract – Min High Rate Total**
B1	32 l/s continuous
C1	39 l/s continuous
D	28 l/s continuous