



London Borough of Hillingdon

BELMORE ALLOTMENTS, HAYES

Overheating Assessment





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Overheating Assessment

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APPENDIX A

SPECIFICATION / ASSUMPTIONS

EXECUTIVE SUMMARY

WSP have been appointed by the London Borough of Hillingdon to provide an Overheating Assessment report to support the planning application of the proposed residential development at the Former Bellmore Allotments site in-line with the GLA requirements.

Full planning permission is sought for the demolition of the existing building for redevelopment of five buildings consisting of 111 residential units comprising 32 x 1-bed; 48 x 2-bed; and 31 x 3-bed, 127 No. parking spaces, cycle storage and other ancillary works. All of the blocks will be allocated for social housing with the units within Blocks A, C and D provided for shared ownership, within Block B at a discounted market sale and Block E for rental.

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.

Assessing all of the units would be unduly onerous and therefore, the top floor for one of the blocks has been assessed; these are broadly representative of the different unit types and risk of overheating while top floor apartments considered the most at risk of overheating due to lack of shading.

The methodology and assumptions outlines in CIBSE Guide TM59: 2017 – Design methodology for the assessment of overheating risk in homes.

The units were first modelled using the current design summer year (1989) weather files for Heathrow for the 2020s, high emissions, 50% scenario in line with CIBSE Guide TM59.

As the windows were assumed to have unrestricted openings (as there are no acoustic concerns), the recommended test criterion used was as per the naturally ventilated homes test described in CIBSE Guide TM59 i.e. CIBSE TM52 Criterion 1 and an additional requirement for bedrooms only limited the number of hours over 26°C at night.

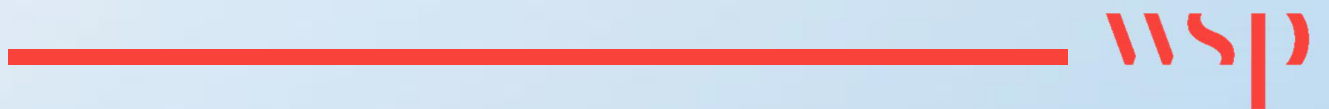
The risk of overheating has been minimised through the use of recessed windows, low g-value glazing and large openable windows.

Following this methodology, all of the habitable rooms were found not to overheat, meeting both of the overheating criteria.

Therefore no additional cooling technologies will be specified or required in order to ensure user comfort is maintained.

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PROJECT BACKGROUND



1. PROJECT BACKGROUND

1.1. DEVELOPMENT DESCRIPTION

- 1.1.1. The scheme 111 residential units comprising 32 x 1-bed; 48 x 2-bed; and 31 x 3-bed, 127No. parking spaces, cycle storage and other ancillary works.
- 1.1.2. The dwellings are to be serviced by individual gas boilers. The building specification used in this analysis for main fabric elements are shown in Appendix A.

Table 1 - Schedule of Accommodation

Type	Description	Block A	Block B	Block C	Block D	Block E	Area
A1	1 Bed	2	4	2	2	6	50.2-50.4 m ²
A2	1 Bed	2	-	2	2	6	51.0-59.5 m ²
A3	1 Bed	1	-	-	-	2	51.3-56.4 m ²
A4	1 Bed	1	-	-	-	-	53.1 m ²
B1	2 Bed	2	4	2	2	4	70.0-71.9 m ²
B2	2 Bed	2	6	3	3	6	70.4-72.9 m ²
B3	2 Bed	1	2	1	1	-	70.8-73.9 m ²
B4	2 Bed	3	-	3	3	-	71.8-73.9 m ²
C1	3 Bed	3	10	3	3	6	86.1-92.7 m ²
C2	3 Bed	-	2	-	-	2	88.0-90.4 m ²
C3	3 Bed	-	2	-	-	-	89.1 m ²
Total		17	30	16	16	32	

Figure 1 Site Location Map for the Proposed Development (site boundary within red line)



Figure 2 Proposed Site Plans

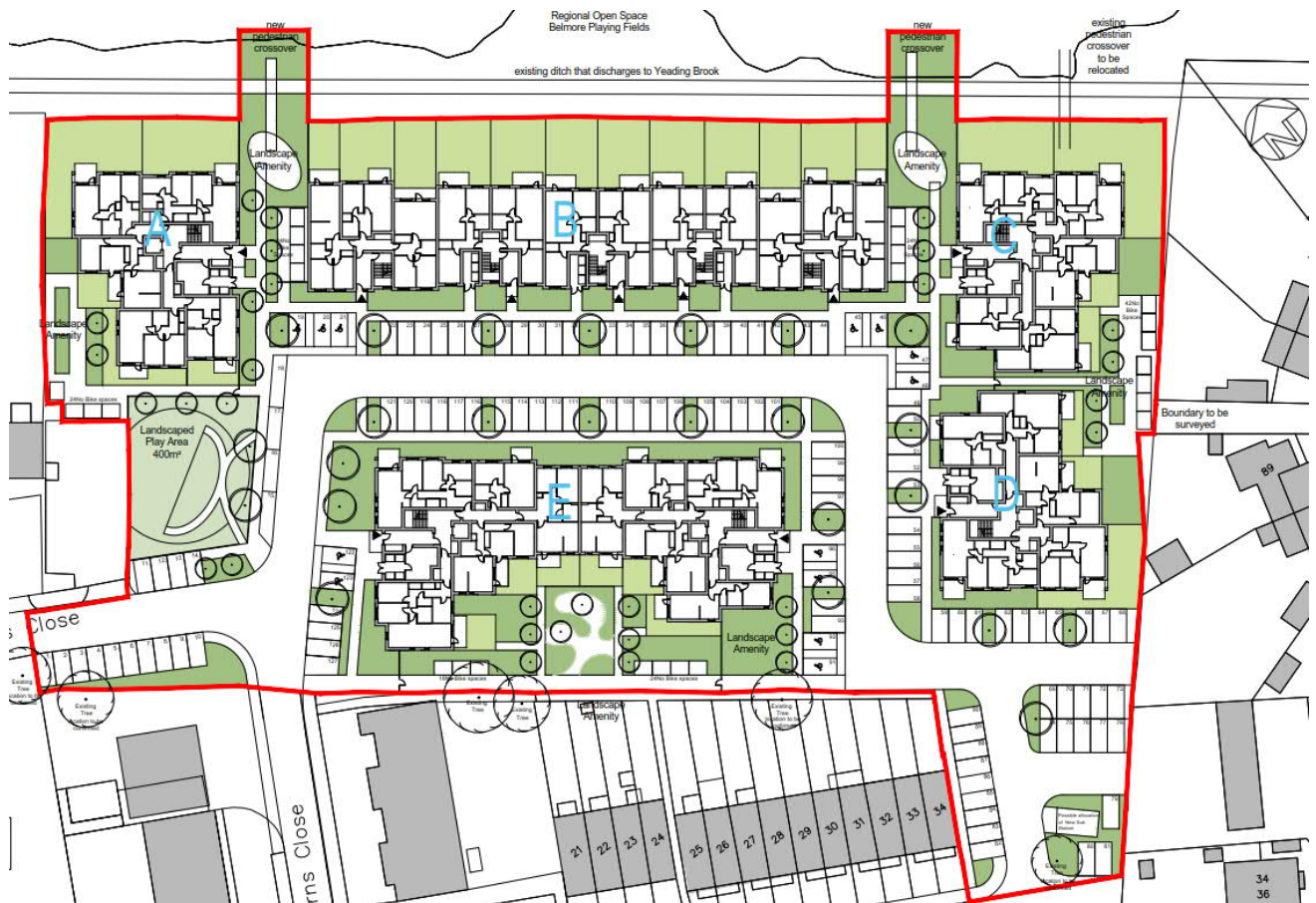
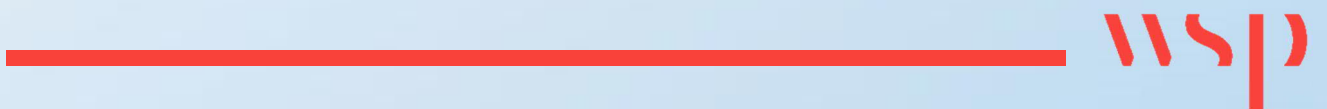


Figure 3 Proposed Elevations



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DWELLING OVERHEATING MODELLING



2. DWELLING OVERHEATING MODELLING

2.1. LONDON PLAN (POLICY 5.9)

2.1.1. Policy 5.9 of the London Plan requires development proposals to reduce potential overheating and reliance on mechanical cooling systems and demonstrate this is in accordance with the following cooling hierarchy:

- Minimise internal heat generation through energy efficient design;
- Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
- Manage the heat within the building through exposed internal thermal mass and high ceilings;
- Passive ventilation;
- Mechanical ventilation;
- Active cooling systems.

2.2. OVERHEATING ANALYSIS

2.2.1. WSP 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. Version 2017.3.0.0 was used in this analysis.

2.2.2. An overheating analysis was carried out on the flats considered most at risk of overheating within the development. In general units on the upper floors and south facings were selected as these would have the most solar gain and benefit the least from shading from adjacent buildings. Units were selected from Blocks B, E and D (Block D is considered to be very similar in terms of internal layout to Blocks A and C).

2.2.3. For Block B, 4 units were selected for this analysis.

- A second floor 3-Bed unit was selected consisting of 2No. double bedrooms, 1No. single bedroom and a kitchen / living room.
- A first floor 1-Bed unit was selected consisting of 1No. double bedroom and a kitchen / living room.
- A first floor 2-Bed unit was selected consisting of 2No. double bedrooms and a kitchen / living room.
- A first floor 3-Bed unit was selected consisting of 2No. double bedrooms, 1No. single bedroom and a kitchen / living room.

2.2.4. As individual heating systems were specified, the overheating risk in the Block B communal corridors was not required / considered.

Figure 4 Block B Proposed Internal Layouts



2.2.5. For Block E, 4 units were selected for this analysis.

- A second floor 1-Bed unit was selected consisting of 1No. double bedroom and a kitchen / living room.
- A second floor 1-Bed unit was selected consisting of 1No. double bedroom and a kitchen / living room.
- A second floor 2-Bed unit was selected consisting of 2No. double bedrooms and a kitchen / living room.
- A second floor 3-Bed unit was selected consisting of 2No. double bedrooms, 1No. single bedroom and a kitchen / living room.

2.2.6. As individual heating systems were specified, the overheating risk in the Block B communal corridors was not required / considered.

Figure 5 Block E Proposed Internal Layouts



2.2.7. For Block D, 5 units were selected for this analysis.

- A second floor 1-Bed unit was selected consisting of 1No. double bedroom and a kitchen / living room.
- A second floor 2-Bed unit was selected consisting of 2No. double bedrooms and a kitchen / living room.
- A second floor 2-Bed unit was selected consisting of 2No. double bedrooms and a kitchen / living room.
- A second floor 2-Bed unit was selected consisting of 2No. double bedrooms and a kitchen / living room
- A second floor 3-Bed unit was selected consisting of 2No. double bedrooms, 1No. single bedroom and a kitchen / living room.

2.2.8. As individual heating systems were specified, the overheating risk in the Block B communal corridors was not required / considered.

Figure 6 Block D Proposed Internal Layouts

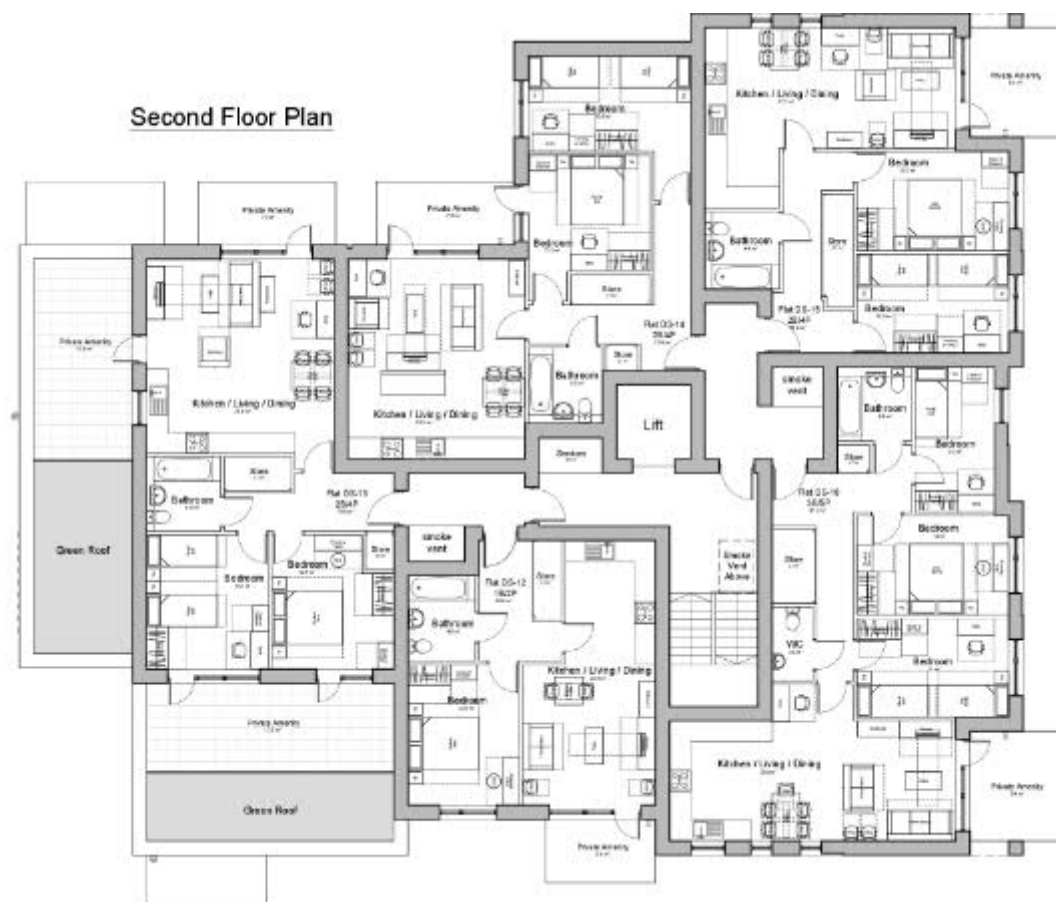
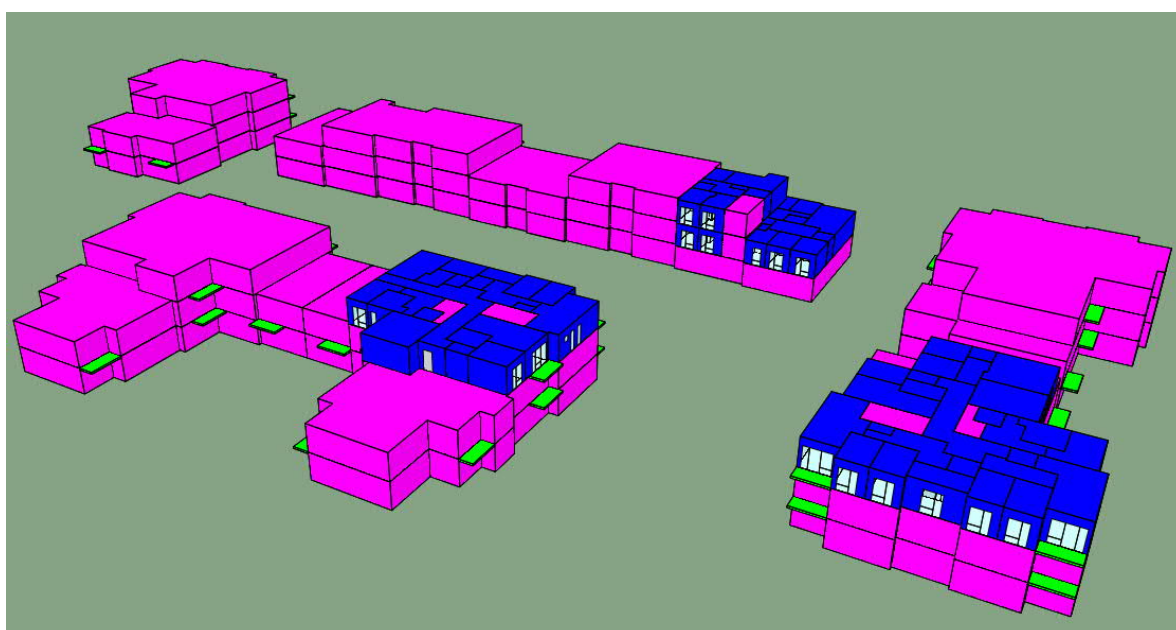


Figure 7 IES model



- 2.2.9. 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' (DSY1) weather files for London Heathrow (for 2020, high emissions, 50% scenario) and the Guide A overheating criteria were applied to determine the level of thermal comfort.

2.3. CIBSE TM52 OVERHEATING CRITERIA

- 2.3.1. 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.
- 2.3.2. 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.
- The first criterion states the number of hours (H_e) during which ΔT (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.
 - 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 (W_e) shall be less than or equal to 6.
 - The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable. The value of ΔT shall not exceed 4°K .
- 2.3.3. This analysis only covers the habitable rooms in the house, i.e. the kitchen/living areas and bedrooms.
- 2.3.4. This criterion is used only for units which have unrestrictive window openings; this is not the case for this development.

2.4. CIBSE TM49 DESIGN SUMMER YEARS

- 2.4.1. 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.
- 2.4.2. Hourly weather data files containing the full set of weather variables required for building dynamic thermal simulation were used for these years.
- 2.4.3. Current industry good practice suggests the use of the 2020 London Heathrow 1989 Design Summer Year weather file for high emission scenario 50%; this has been modelled. Ensuring that the units pass this weather file is seen as the main benchmark for ensuring an acceptable level of

risk of overheating. If the Proposed Development passes this criterion, the additional design years described above may also be assessed.

2.5. CIBSE GUIDE TM59 – DESIGN METHODOLOGY FOR THE ASSESSMENT OF OVERHEATING IN HOMES

2.5.1. CIBSE have recently published their methodology for the assessment of overheating in homes. This document represents best practice for the undertaking of assessments of this type.

2.5.2. This methodology aims to:

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

2.5.3. This methodology does not:

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

2.5.4. As there were no concerns identified which would limit the ability of residents to open windows, the test conditions for naturally ventilated buildings apply. Under these conditions compliance is based on passing the following criteria:

- CIBSE TM52 criteria 1 - the number of hours (He) during which ΔT (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.
- For bedrooms only - to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

2.6. MODELLING ASSUMPTIONS

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

- Windows are assumed to be openable for cooling purposes.
- The homes are assumed to be naturally ventilated – no Mechanical Ventilation has been applied.
- 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.

2.7. WINDOW OPENINGS

2.7.1. 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 2 - Glazing specification

Type	'U' Value	'g' Value	Light Transmittance Value
Windows	1.20	0.40	0.71

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

2.8. SUMMARY OF MEASURES

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

Table 3 - 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 with G-values of 0.40, to reduce heat gains Recessed windows
3 - Manage the heat	Structural specification is yet to be confirmed at this stage, but assumed to be typical of dwellings of this type.
4 - Passive measures	Windows are assumed to be openable as per the building plans.
5 - Mechanical measures	No Mechanical Ventilation has been specified at this time. For more information see 'Energy Strategy'.
6 - Active cooling	No active cooling has been specified at this time.

2.8.2. One of changes to the design is the alterations to the room types shown in the figure below. The previous design contained a narrow un-openable window and a door opening onto the terrace area. Due to safety concerns these doors were considered un-openable for cooling purposes due to safety concerns. Therefore the design has been altered to a wider window which is now openable. The results presented include for this change of design.

Figure 8 Altered room types – previous design

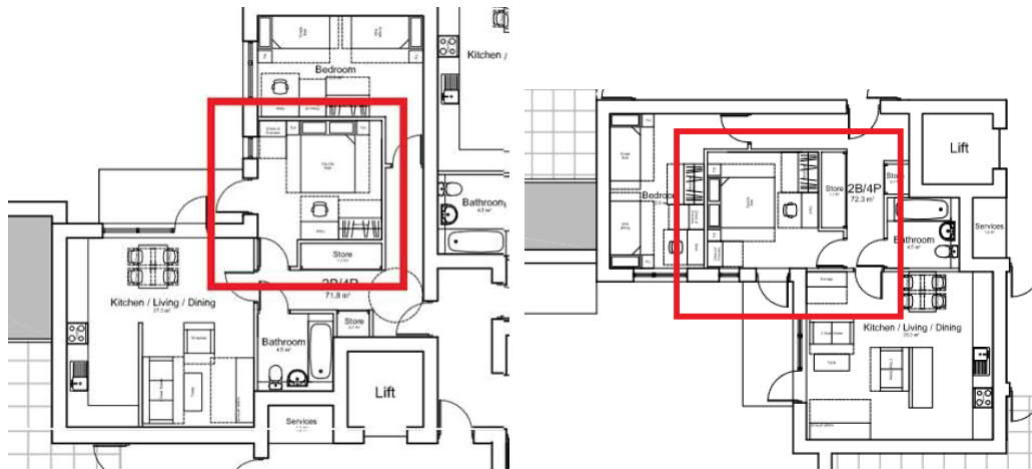
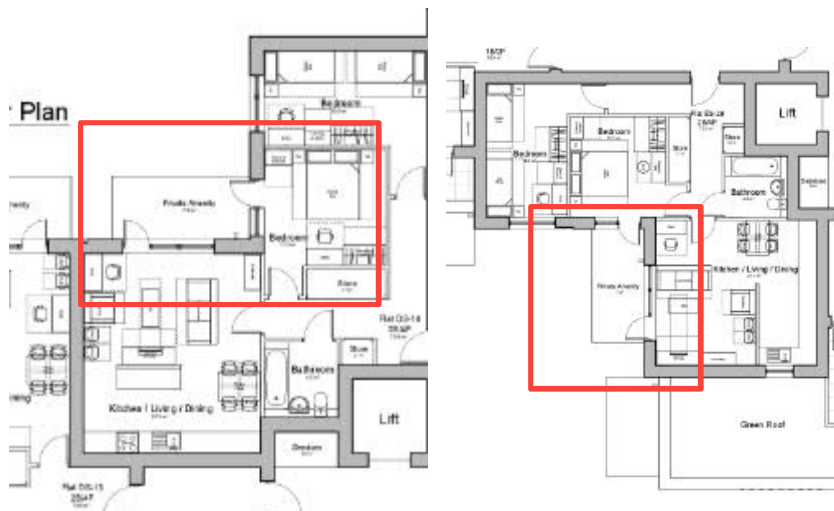
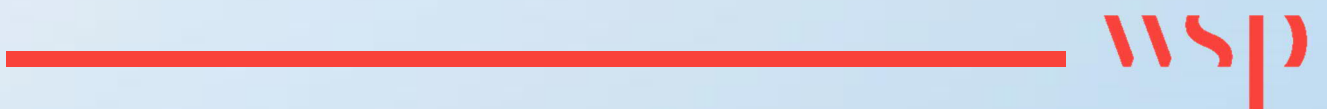


Figure 9 Altered room types – revised design



3

DWELLING OVERHEATING RESULTS



3. DWELLING OVERHEATING RESULTS

3.1. RESULTS

- 3.1.1. With no cooling technologies employed or changes to the external facade, and **without the consideration of internal blinds**, 6 of the habitable rooms considered are shown to overheat when assessed against the specified design summer year (1989 - 2020, high emissions, 50% scenario).
- 3.1.2. A summary of the analyses undertaken for the specified design year are provided in the table below.

Table 4 - Summary of overheating analysis results, number of failures – No Blinds

Block	Unit	CIBSE TM52 Criterion 1 failures (Number of rooms)	Bedrooms criteria failures (Number of rooms)	Overall
Block B – 2 nd Floor	Flat 1	2 (of 4)	0 (of 3)	Fail
Block B – 1 st Floor	Flat 2	0 (of 3)	0 (of 2)	Pass
	Flat 3	0 (of 2)	0 (of 1)	Pass
	Flat 4	0 (of 4)	0 (of 3)	Pass
Block D – 2 nd Floor	Flat 1	0 (of 3)	0 (of 2)	Pass
	Flat 2	0 (of 2)	0 (of 1)	Pass
	Flat 3	1 (of 4)	0 (of 3)	Fail
	Flat 4	3 (of 3)	0 (of 2)	Fail
	Flat 5	0 (of 3)	0 (of 2)	Pass
Block E – 2 nd Floor	Flat 1	0 (of 3)	0 (of 2)	Pass
	Flat 2	0 (of 2)	0 (of 1)	Pass
	Flat 3	0 (of 4)	0 (of 3)	Pass
	Flat 4	0 (of 2)	0 (of 1)	Pass

- 3.1.3. Within the methodology, the use of internal blinds is considered an acceptable mitigation strategy. Once this is modelled, the risk of overheating is shown to reduce to acceptable levels.
- 3.1.4. With no cooling technologies employed or changes to the external facade, and **with the consideration of internal blinds**, none of the habitable rooms considered are shown to overheat

when assessed against the specified design summer year (1989 - 2020, high emissions, 50% scenario).

3.1.5. A summary of the analyses undertaken for the specified design year are provided in the table below.

Table 5 - Summary of overheating analysis results, number of failures – With Blinds

Block	Unit	CIBSE TM52 Criterion 1 failures (Number of rooms)	Bedrooms criteria failures (Number of rooms)	Overall
Block B – 2 nd Floor	Flat 1	0 (of 4)	0 (of 3)	Pass
Block B – 1 st Floor	Flat 2	0 (of 3)	0 (of 2)	Pass
	Flat 3	0 (of 2)	0 (of 1)	Pass
	Flat 4	0 (of 4)	0 (of 3)	Pass
Block D – 2 nd Floor	Flat 1	0 (of 3)	0 (of 2)	Pass
	Flat 2	0 (of 2)	0 (of 1)	Pass
	Flat 3	0 (of 4)	0 (of 3)	Pass
	Flat 4	0 (of 3)	0 (of 2)	Pass
	Flat 5	0 (of 3)	0 (of 2)	Pass
Block E – 2 nd Floor	Flat 1	0 (of 3)	0 (of 2)	Pass
	Flat 2	0 (of 2)	0 (of 1)	Pass
	Flat 3	0 (of 4)	0 (of 3)	Pass
	Flat 4	0 (of 2)	0 (of 1)	Pass

3.1.6. In order to meet the requirements as set out in the CIBSE TM59 guidance, the development must ensure that the requirements as set out in the CIBSE Guide TM52 Criterion 1. All the habitable rooms have been shown to meet this requirement.

3.1.7. Also In order to meet the requirements as set out in the CIBSE TM59 guidance, the bedroom must be shown to minimise overnight temperatures; this requirement has also been met

3.1.8. As shown in the table above, this development, without the use of mechanical ventilation or active cooling, has met all of the overheating requirements as per the requirement. Therefore no further measures are required in order to ensure comfort of the residents.

3.2. CONCLUSIONS

- 3.2.1. This assessment shows that under the requirements set out in CIBSE Guide TM59, the units are shown to have an acceptable risk of overheating.
- 3.2.2. No further requirements are needed in order to ensure user comfort.

Appendix A

wsp
SPECIFICATION / ASSUMPTIONS

BUILDING FABRIC

Specification	Value
External Wall - U Value (W/m ² .K)	0.14
Roof - U Value (W/m ² .K)	0.10
Floors - U Value (W/m ² .K)	0.10
Party Walls - U Value (W/m ² .K)	0.00
Windows - U Value (W/m ² .K)	1.20
Window - Visible Light Transmittance	0.71
Window – G Value	0.40

OPENING TYPES

Name	Parameters	Value
External Windows – Openable	Type	Side Hung
	Openable Area	90%
	Max Angle Open	90°
	Behaviour	Openable when rooms are occupied and external temperature exceed 21°C
External Doors – Not Openable	Type	Side Hung
	Openable Area	-
	Max Angle Open	-
	Behaviour	Not openable due to safety concerns
Internal Blinds	Type	Light coloured blinds
	Shading Coefficient	0.4
	Short-wave radiant fraction	0.3



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