Thermal Comfort Assessment

(in accordance with CIBSE TM59 and Part O)

London Square & Ascot Central Car Park Limited

South of Ascot High Street
Ascot
Royal Borough of Windsor and Maidenhead

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1	B	14/11/2022	Sophie Hopwood	-	Sophie Hopwood
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This Thermal Comfort Report has been undertaken by SRE for the Proposed Development at site south of High Steet, Ascot (the Proposed Development) on behalf of London Square (the Client).

This report assesses thermal comfort measures for the Proposed Development, to demonstrate compliance with 2021 Building Regulations Part O1, thus ensuring the summertime thermal condition within the buildings and the associated rooms meet the standards set out in the Chartered Institute of Building Services Engineers (CIBSE) TM59: 2017 methodology.

In order to assess the thermal performance of the Proposed Development, a model of the Proposed Development with detailed geometry of selected sample units predominantly from the southwest direction of each block has been created within the dynamic thermal analysis software Integrated Environmental Solutions – Virtual Environment (IES-VE) 2023. The units from the southwest direction are preferred as they receive the highest solar gain which increases the risk of overheating, thereby representing the worst case scenario. The units are selected from different floors to incorporate all possible conditions within the analysis. Additionally, night-time window opening profiles align with acoustic requirements set out by Pulsar Acoustics.

This report describes the dynamic thermal modelling exercise undertaken, lists all the assumptions used and presents the results obtained. All results should be taken as an indication of the likely final situation, but these conditions cannot be guaranteed.

A range of passive design measures have been incorporated, where feasible, to optimise summertime thermal comfort conditions and minimise the overheating risks. This is done through a combination of the buildings' shape, building fabric specifications, external shading through balconies and overhangs and solar control glazing with a G-value of 0.40. Active design measures such as mechanical ventilation with heat recovery (MVHR) with purge ventilation have been incorporated into the design.

The results of the simulations indicate that under current climate conditions (London Gatwick DSY1 2020s high emissions, 50th percentile), the Proposed Development passes the TM59 assessment criteria using a combination of passive and active design strategies, indicating a good level of thermal comfort during summer periods.

For certain spaces in Block 1, 2, 3 & T1, the proposed passive and active design measures were not sufficient to reduce the risk of overheating in line with Part O standards whilst complying with the acoustic requirements set by Pulsar Acoustics, therefore active cooling is proposed for these units.

An additional simulation was carried out using a future weather file (London Gatwick DSY1 2050s high emissions, 50th percentile) to further test the robustness of the design. The results of the simulation indicate that measures will need to be taken to mitigate overheating in majority of the spaces. It should be noted that a pass is not mandatory under the future weather file scenario, but the overheating risk can be reduced in the future by incorporating internal/external shutters, external shades, etc. Also, the overheating issues in the communal corridors with communal heating pipework can be reduced by improving the insulation and the efficiency of the pipework.

In relation to CIBSE TM59 requirements and Building Regulations Part O Requirement O1, the Proposed Development meets the assessment criteria.

Introduction

1.0 Introduction

This Overheating Analysis has been undertaken by SRE for the Proposed Development at site south of Ascot High Steet, Ascot.

Following the guidance of the Chartered Institute of Building Services Engineers (CIBSE) TM59: 2017 methodology, and The Building Regulations 2010, Part O: 2022, this study assesses the Proposed Development's overheating risk in relation to the intensity of heat gains, occupancy patterns, building orientation, dwelling layout, shading strategy and ventilation method in response to the relevant requirements for the development.

All results are based on outputs from dynamic thermal simulation software Integrated Environmental Solutions – Virtual Environment (IES-VE) 2023, which is fully compliant with CIBSE Applications Manual AM11, and should be taken as an indication of the expected final situation. However, these conditions cannot be guaranteed.

It is important to note that with any modelling exercise there are assumptions and approximations that have to be made. As far as possible, details of all assumptions made, and approximations used are supplied as part of the report.

1.1 The Proposed Development

The Proposed Development is a mixed-use development, consisting of 2,077.4m^2 commercial including community floorspace and 117 dwellings.

The site is located in Ascot, South of the High Street and East of Station Hill. Figure 1 shows the elevations of one of the buildings within the Proposed Development. See Appendix A for the full site plan.

Figure 1 - Elevations of Apartment Block 2 of the Proposed Development (DHA Architecture Ltd)

2.0 Methodology

2.1 CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Homes

The performance standards set in CIBSE TM59: 2017 have been used to assess the overheating risk within the Proposed Development. Compliance is based on passing both of the following two criteria:

1. For living rooms, kitchens and bedrooms: the number of hours during which the operative temperature exceeds the threshold comfort temperature by 1°C during the period May to September inclusive shall not be more than 3% of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).
2. For bedrooms only: the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of occupied hours. (Note: 1% of occupied hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours will be recorded as a fail).

In addition to living rooms, kitchens and bedrooms, the inclusion of corridors in the overheating analysis is mandatory where community heating pipework runs through them. The overheating test for corridors should be based on the number of annual hours for which an operative temperature of 28 °C is exceeded. Whilst there is no mandatory target to meet, if an operative temperature of 28 °C is exceeded for more than 3% of the total annual hours, then this should be identified as a significant risk within the report.

The overheating risk of the habitable spaces are assessed under the CIBSE design summer year (DSY) weather files for London Gatwick. A pass is required using the DSY1 2020s, high emissions, 50th percentile weather file. Other files including the more extreme DSY2 and DSY3 files, as well as future files (i.e., 2050s or 2080s), should be used to further test designs of particular concern, but a pass is not mandatory.

2.2 Approved Document Building Regulations Part O

The approved document Building Regulations Part O has been written with the aim to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures.

Compliance with requirement O1 can be demonstrated by using one of the following methods:

a. The simplified method for limiting solar gains and providing a means of removing excess heat

b. The dynamic thermal modelling method

This report details a dynamic thermal modelling method for demonstrating compliance with requirement O1. It provides a standardised approach to predicting overheating risk for residential buildings using dynamic thermal modelling as an alternative to the simplified method.

CIBSE's TM59 method requires the modeller to make choices. The dynamic thermal modelling method in Part O applies limits to these choices, including:

a. When a room is occupied during the day (8am to 11pm), openings should be modelled to do all

of the following:

i. Start to open when the internal temperature exceeds 22°C.
ii. Be fully open when the internal temperature exceeds 26°C.
iii. Start to close when the internal temperature falls below 26°C.
iv. Be fully closed when the internal temperature falls below 22°C.

b. At night (11pm to 8am), openings should be modelled as fully open if both of the following apply:

i. The opening is on the first floor or above and not easily accessible.
ii. The internal temperature exceeds 23°C at 11pm.

c. When a ground floor or easily accessible room is unoccupied, both of the following apply:
i. In the day, windows, patio doors and balcony doors should be modelled as open, if this can be done securely.
ii. At night, windows, patio doors and balcony doors should be modelled as closed.

d. An entrance door should be included, which should be shut all the time.

Based on Building Regulations Part O, mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it. The building should be constructed to meet requirement O1 using passive means as far as reasonably practicable. It should be demonstrated to the building control body that all practicable passive means of limiting unwanted solar gains and removing excess heat have been used first before adopting mechanical cooling. Any mechanical cooling (air-conditioning) is expected to be used only where requirement O1 cannot be met using openings.

Dynamic Model

3.0 Dynamic Model

The thermal modelling has been carried out using IES-VE 2023. IES-VE is a fully dynamic analysis tool which is compliant with CIBSE TM33 and ASHRAE 140 standards among other software testing standards. A 3D thermal model of the Proposed Development has been created based on the architectural drawings provided by the DHA Architecture Ltd.

The images shown in Figure 2 and Figure 3 are taken from the IES-VE model and shows the full geometry of the Proposed Development within the thermal model along with detailed geometry of selected 10 no. sample units predominantly from the southwest direction of each block. As with any modelling exercise, some approximations have to be made, but care should be taken to ensure that the scale and dimensions of the model are as close as practical to the design drawings, and that glazing areas are accurately represented.

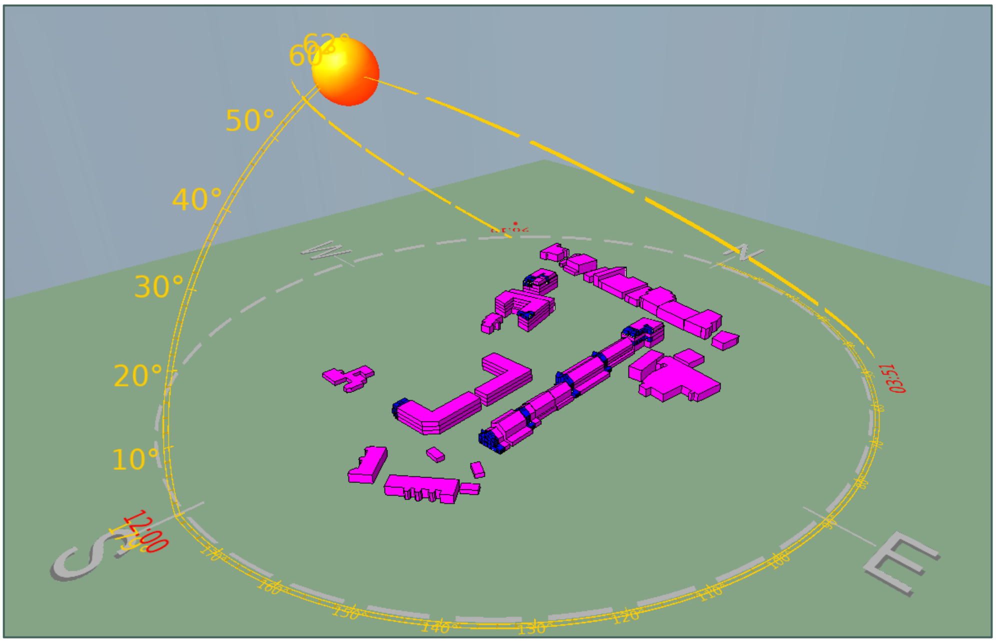


Figure 2 - Image of the 3D model in the IES-VE 2023 software, view from the Southeast

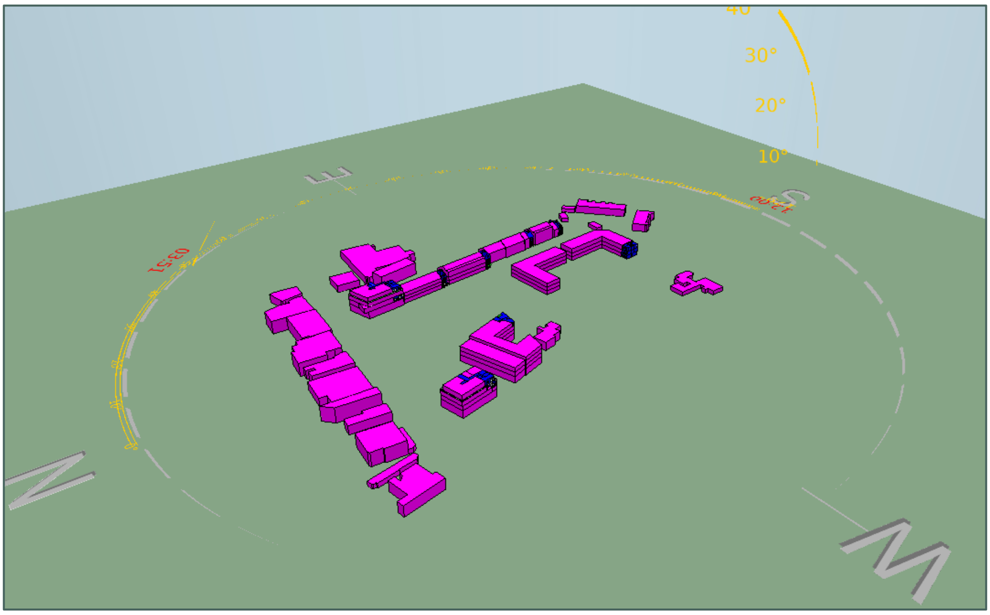


Figure 3 - Image of the 3D model in the IES-VE 2023 software, view from the Northwest

The building has been divided into different zones in relation to use. Appropriate profiles and internal gains have been assigned in the different areas, but only the results of the main occupied spaces have been assessed in this study. Secondary spaces occupied only briefly (less than 30 minutes), such as toilets and cupboards are outside the scope of this study.

The assessed occupied spaces in the Proposed Development and their floor areas are listed below in Figure 1. These units are selected from the southwest direction to represent a worst case scenario as it receives the highest solar gain compared to other directions and the selection is from a mix of floors to incorporate all conditions into the analysis.

Units	Space	Floor Area (m^2)
Block 1 – B1-70d (Second Floor)	Bedroom 1	14.02
	Bedroom 2	12.90
	Living/Kitchen/Dining	29.02
Block 1 – B1-61d (Third Floor)	Bedroom 1	13.55
	Bedroom 2	10.16
	Living/Kitchen/Dining	23.73
Block 2 – B2-70a (Third Floor)	Bedroom 1	16.60
	Bedroom 2	16.04
	Living/Kitchen/Dining	28.00
Block 3 – B3-70a (First Floor)	Bedroom 1	14.95
	Bedroom 2	13.59
	Living/Kitchen/Dining	31.52
Block 3 – B3-61a (Third Floor)	Bedroom 1	11.94
	Bedroom 2	8.01
	Living/Kitchen/Dining	30.61
T1 – HT A3 (Plot 59)	Bedroom 1	16.08
	Bedroom 2	16.61
	Bedroom 3	16.08
	Bedroom 4	13.34
	Living	21.26

Units	Space	Floor Area (m^2)
	Kitchen/Dining	36.80
T2 – HT B1 (Plot 67)	Bedroom 1	22.60
	Bedroom 2	17.36
	Bedroom 3	11.71
	Bedroom 4	8.92
	Living	21.07
	Kitchen/Dining/Family	45.82
	Snug	11.15
T3 – HT F (Plot 79)	Bedroom 1	16.08
	Bedroom 2	16.08
	Bedroom 3	16.61
	Living	21.26
	Kitchen/Dining/Family	36.80
	Reception Room	13.34
HT E - (Plot 85)	Bedroom 1	21.09
	Bedroom 2	15.05
	Bedroom 3	12.53
	Living	19.69
	Kitchen/Dining/Family	42.78
	Snug	10.12
T5 – HT C1 (Plot 117)	Principle Suite	21.43
	Bedroom 2	12.73
	Bedroom 3	11.15
	Bedroom 4	10.20
	Drawing Room	25.42

Units	Space	Floor Area (m^2)
	Kitchen/Dining/Family	34.46
	Study/ Snug	8.32

Table 1 - List of assessed occupied spaces and their area statement

Figure 4 to Figure 8 below indicates the thermal templates applied to each space type. Floor plans of the assessed spaces can be found in Appendix A.

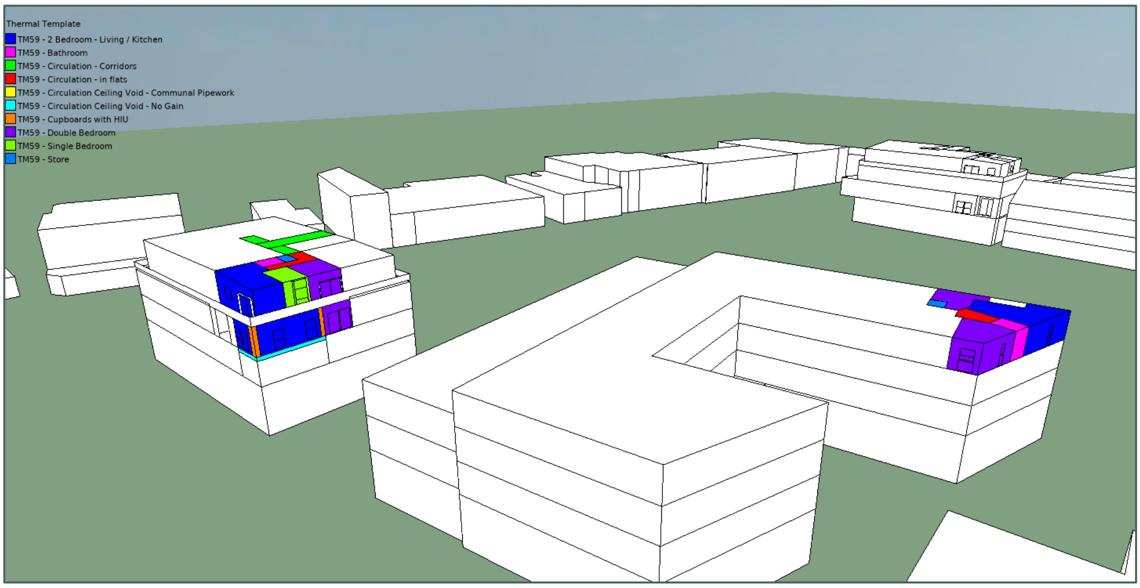


Figure 4 - Thermal zones of assessed spaces within the Block 1 and 2

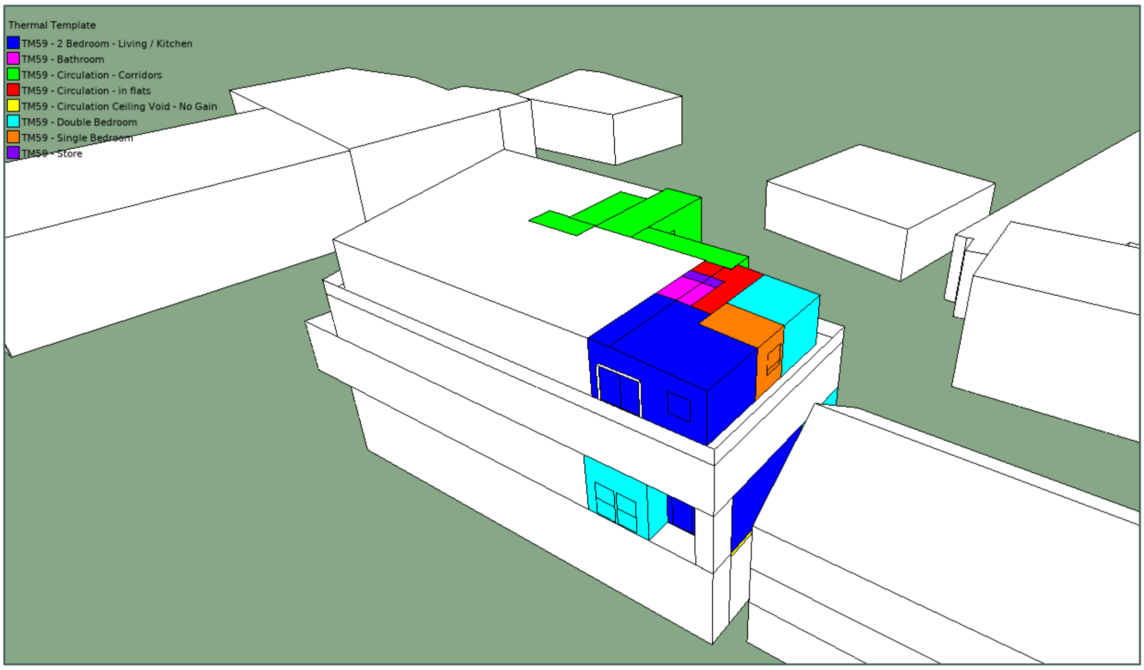


Figure 5 - Thermal zones of assessed spaces within the Block 3

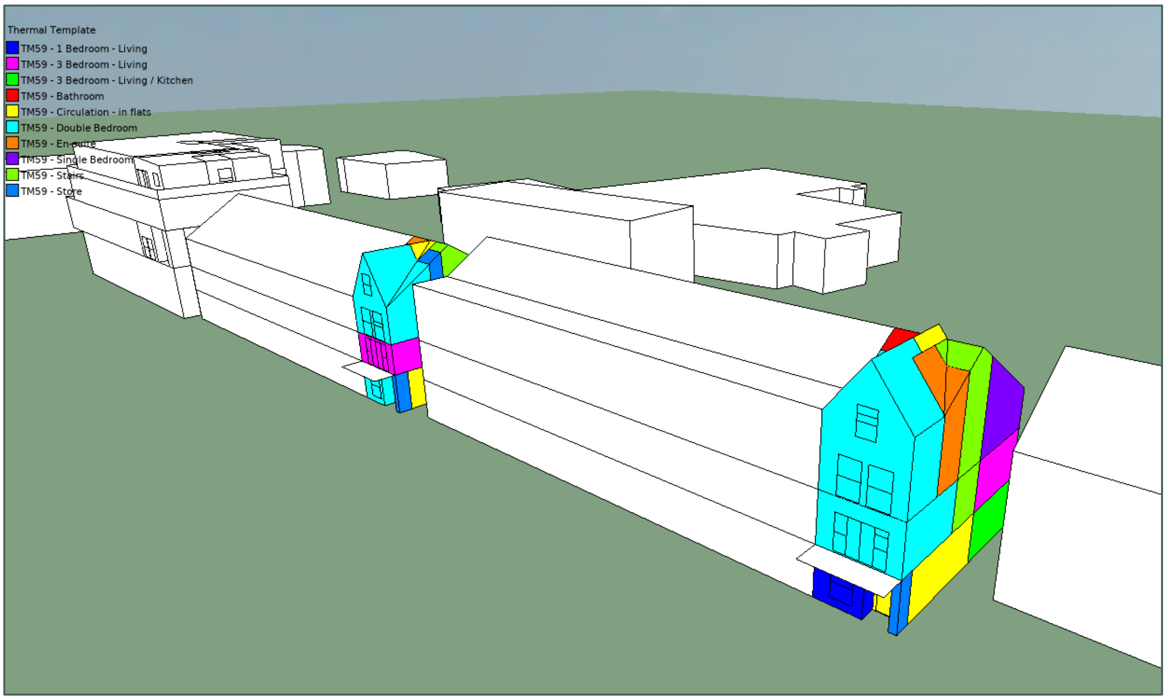


Figure 6 - Thermal zones of assessed spaces within the blocks T1 and T2.

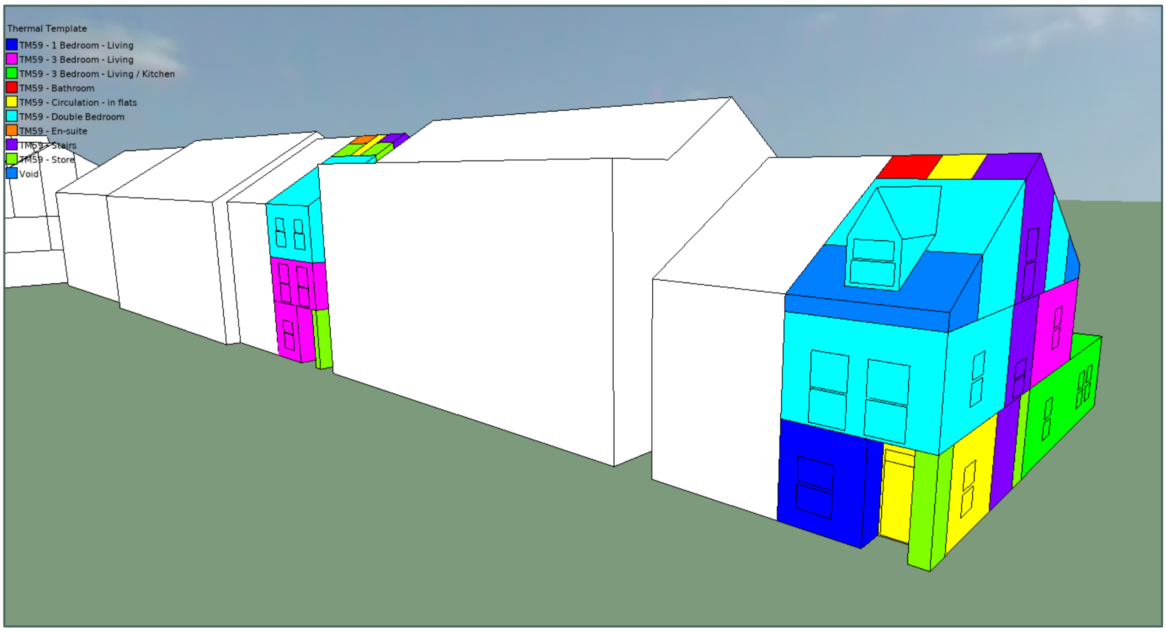


Figure 7 - Thermal zones of assessed spaces within the block T3 and Type E.

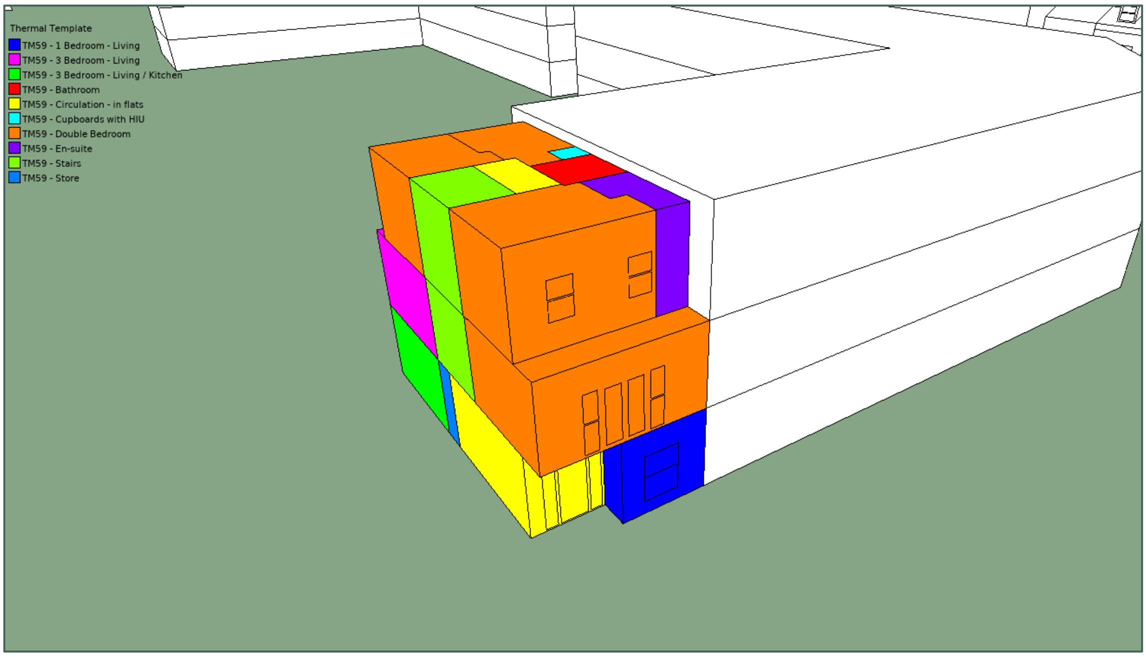


Figure 8 - Thermal zones of assessed spaces within the block T5.

3.1 Building Fabric

High performance fabric has been specified to eliminate heat transfer between the internal conditioned areas and the ambient environment. Table 2 summarises the U-Values of all the fabric elements in the model.

Fabric Element	Proposed U-Value
External Walls	0.18
External Roof	0.13
Ground Floor	0.11
External Windows and Glazed Doors	0.8 (G-value of 0.40)
External Skylights	1.20 (G-value of 0.40)
Solid Doors	1.00

Table 2 - Construction details of the Proposed Development

3.2 Occupancy and internal gain profiles

Based on CIBSE Guide A and TM59, a maximum sensible heat gain of 75W/person and a maximum latent heat gain of 55 W/person are assumed in occupied spaces in the assessment.

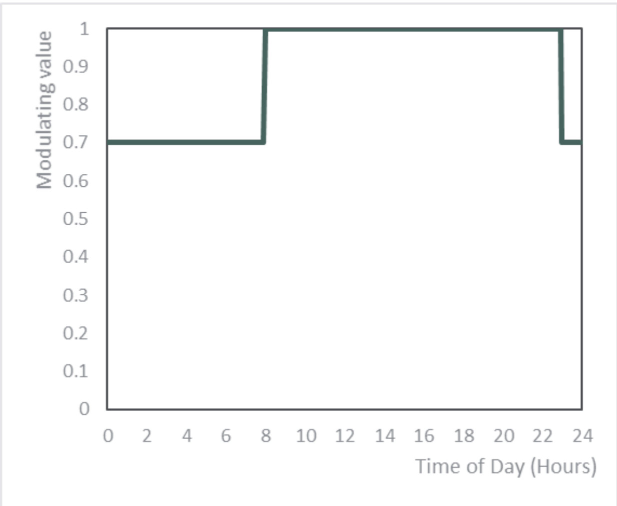
A lighting load of 2 W/m^2 is applied to all occupied spaces, and heat gains from equipment are based on the methodology described in CIBSE TM59, which are summarised in Table 3.

Usage	Equipment Peak Load (W)
Living Rooms	150
Single/Double Bedroom	80
Kitchen/Living/Dining	450
Snug	150

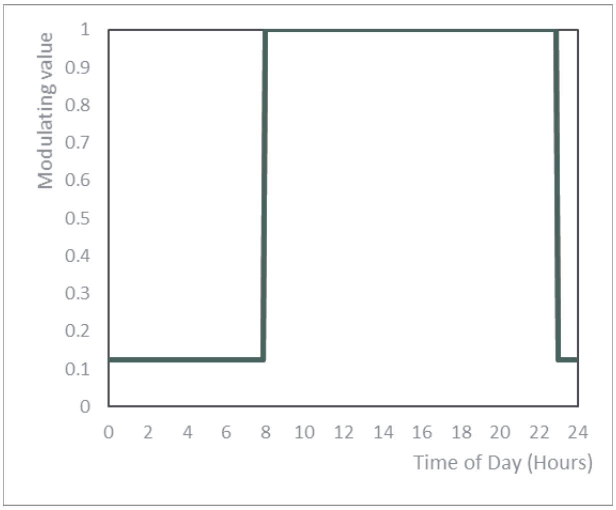
Table 3 - Equipment peak load for different usages

The occupancy and internal gain profiles have been based on the methodology described in CIBSE TM59 standard profiles according to usage, which can be seen in Table 4.

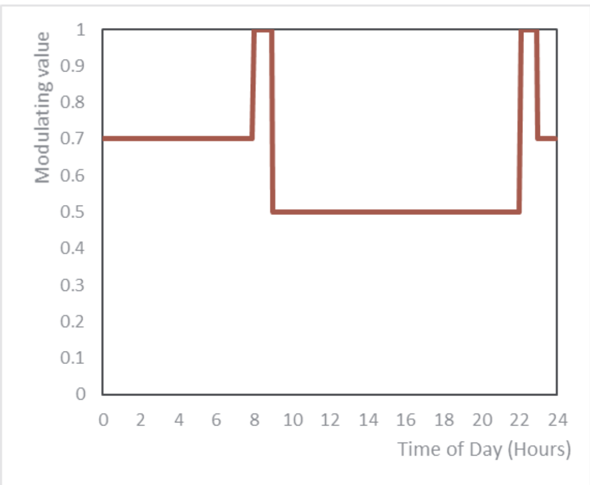
Single Bedroom Occupancy



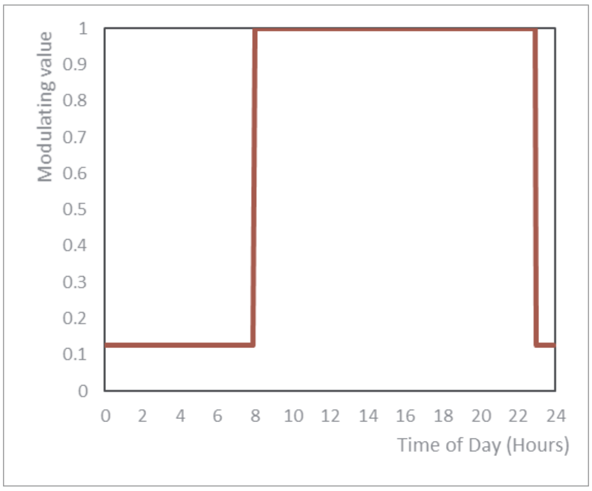
Single Bedroom Equipment



Double Bedroom Occupancy



Double Bedroom Equipment



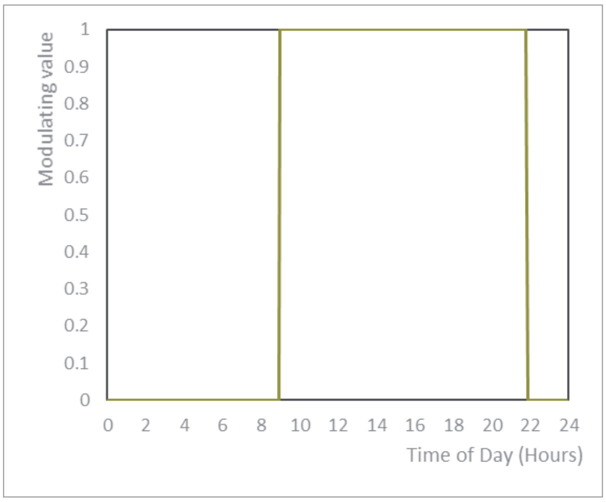
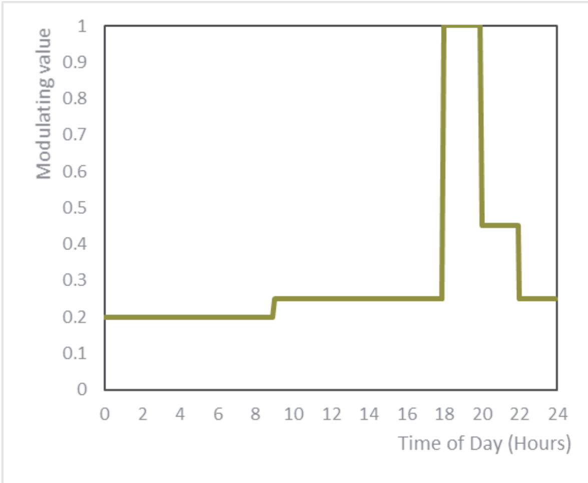
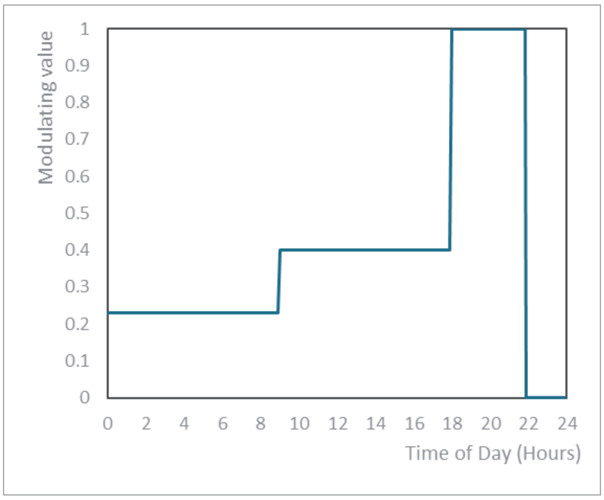
Living/Kitchen Occupancy	Living/Kitchen Equipment
	
Living Equipment	
	

Table 4 - Occupancy and equipment profiles for the occupied space

These profiles represent a model that ensures the key aspects of overheating are captured, which include the following characteristics:

- Bedrooms are set with a 24-hour occupancy profile: one person is always considered in each bedroom during the daytime and two people in each double bedroom at night.
- Kitchens/living rooms are unoccupied during the sleeping hours and occupied during the rest of the day.
- No differences between weekdays and weekends are considered and the dwelling is modelled as occupied for 24 hours.

3.3 Air Exchange

Ventilation to all units will be provided through a mixed-mode strategy via mechanical ventilation with heat recovery (MVHR) with purge ventilation in apartment blocks and whole house MVHR system for the terrace houses. The MVHR systems are coupled with natural ventilation through openable windows to provide additional ventilation and reduce the use of active strategies. A constant airflow of 10 l/s is provided for all the spaces. The list of spaces that require higher MVHR flow rates to achieve comfortable conditions are listed in

Table 7.

A design air tightness of 5 $m^3/hr/m^2$ @50 Pa which equates to an infiltration rate of 0.1283 ACH is applied in all areas.

3.4 Window Openings

In line with the noise survey completed by Pulsar Acoustics, night-time window opening profiles are limited depending on the site location. Figure 9 and Figure 10 shows the noise map showing predicted night-time $L_{eq,T}$ and Lmax noise levels with approximate layout of the Proposed Development. For further details, refer to the Acoustic Assessment Report for Planning by Pulsar Acoustics.

Figure 9 – Noise map showing predicted night-time Leq,T noise levels.[1]

[1] The site plan has been revised since the noise survey was conducted with the latest site plan in Appendix A. Therefore, Figure 10 and Figure 10 has been used as guidance to inform Part O modelling decisions.

Figure 10 – Noise map showing predicted night-time Lmax noise levels.[2]

The specification for the opening areas and angle is summarised in Table 5. Figure 11 to Figure 19 shows the opening types applied within the thermal comfort model. External doors are modelled as fixed shut.

The equivalent area for natural ventilation and glazing areas are listed in Appendix C.

Opening type	Opening category	Openable area (%)	Max. opening
Side Hung Window/Door	Side Hung	95	90
Fixed Window	Fixed	0	-
Top Hung Window	Top Hung	95	30
Sliding Window/Door	Sliding	95	-
Openable Skylights	Top Hung	95	15

Table 5 - Glazing specification - openable areas

[2] The site plan has been revised since the noise survey was conducted with the latest site plan in Appendix A. Therefore, Figure 10 and Figure 10 has been used as guidance to inform Part O modelling decisions.

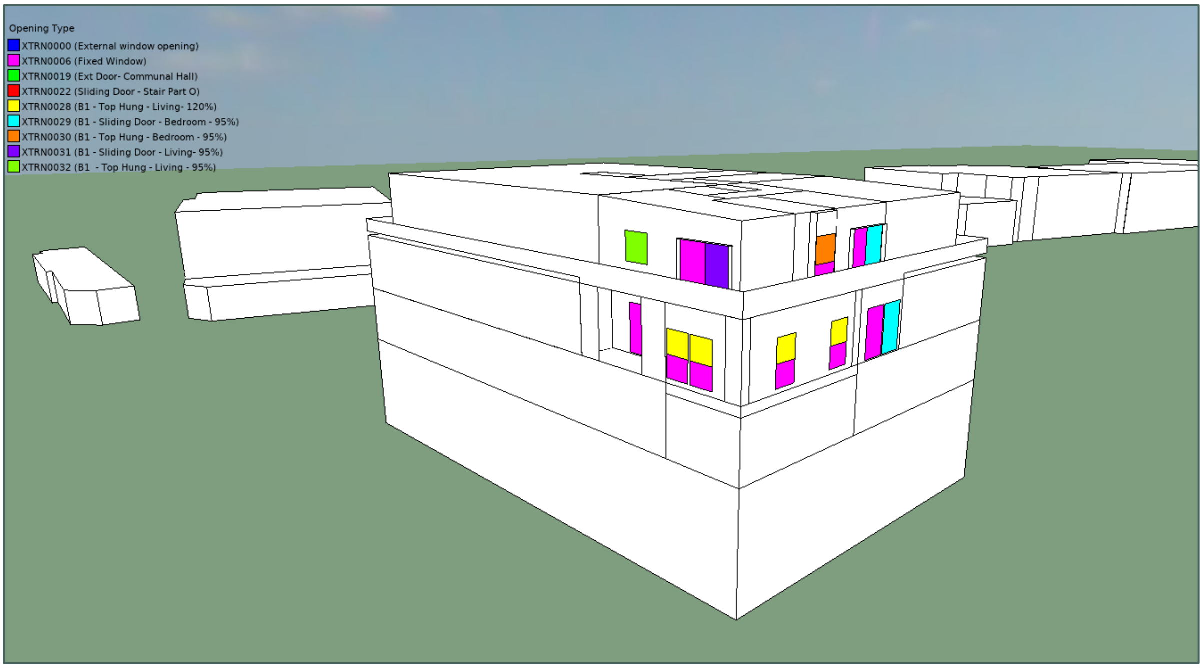


Figure 11 - Opening Types applied within the Block 1 (view from Southwest Elevation)

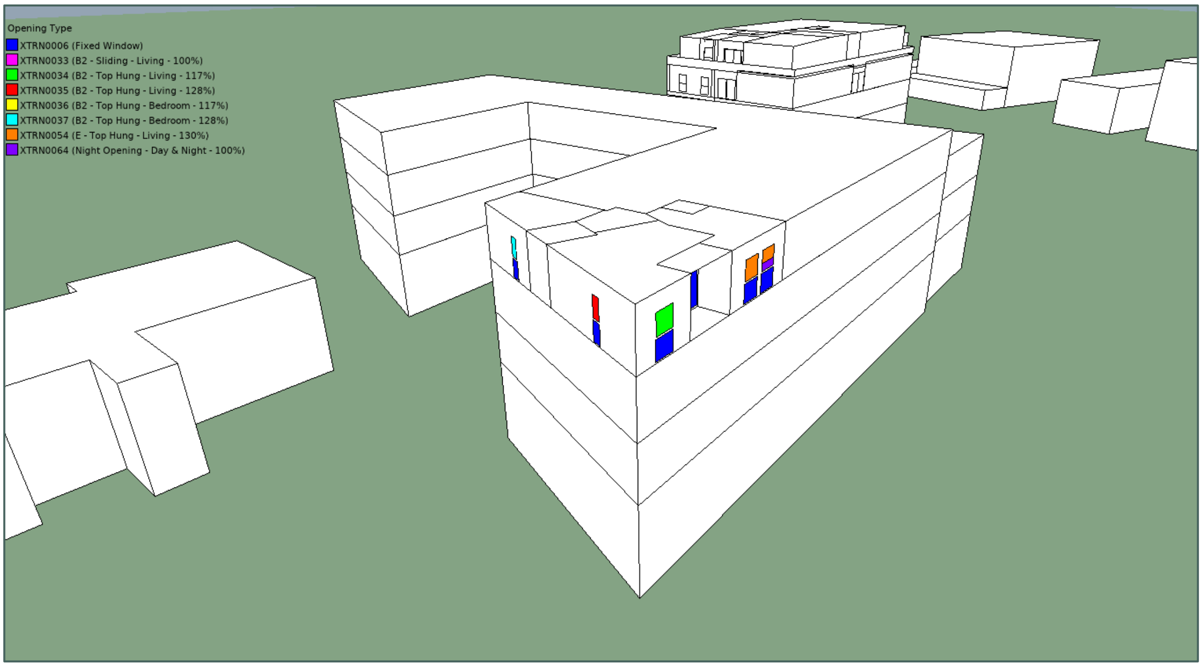


Figure 12 - Opening Types applied within the Block 2 (view from Southeast Elevation)

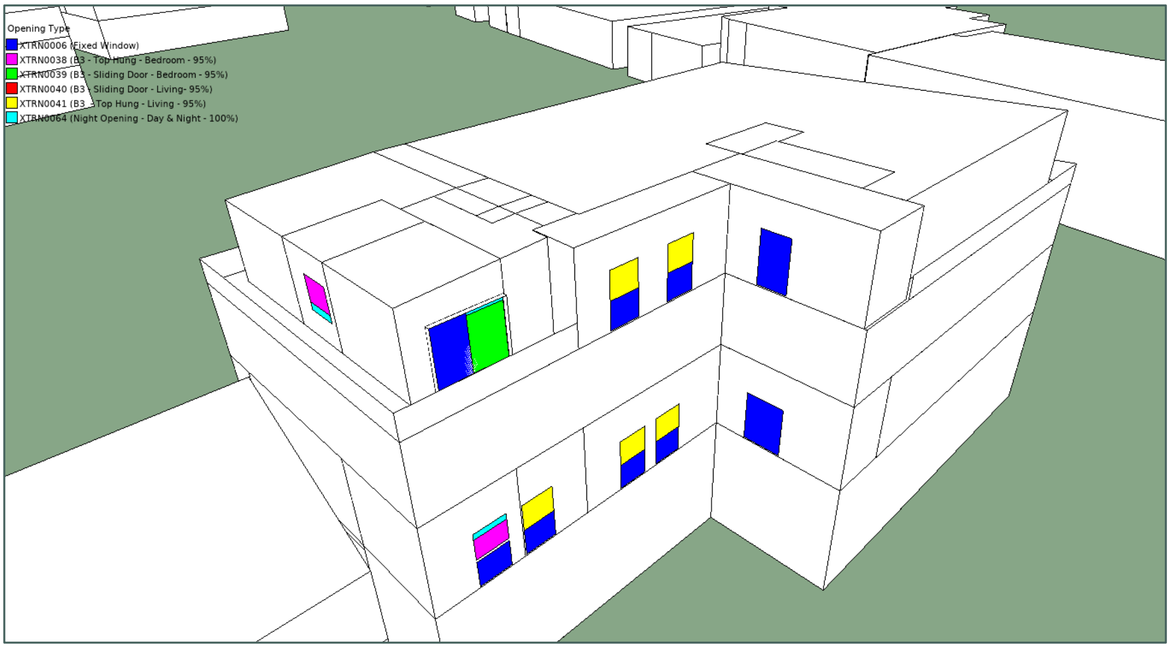


Figure 13 - Opening Types applied within the Block 3 (view from Southwest Elevation)

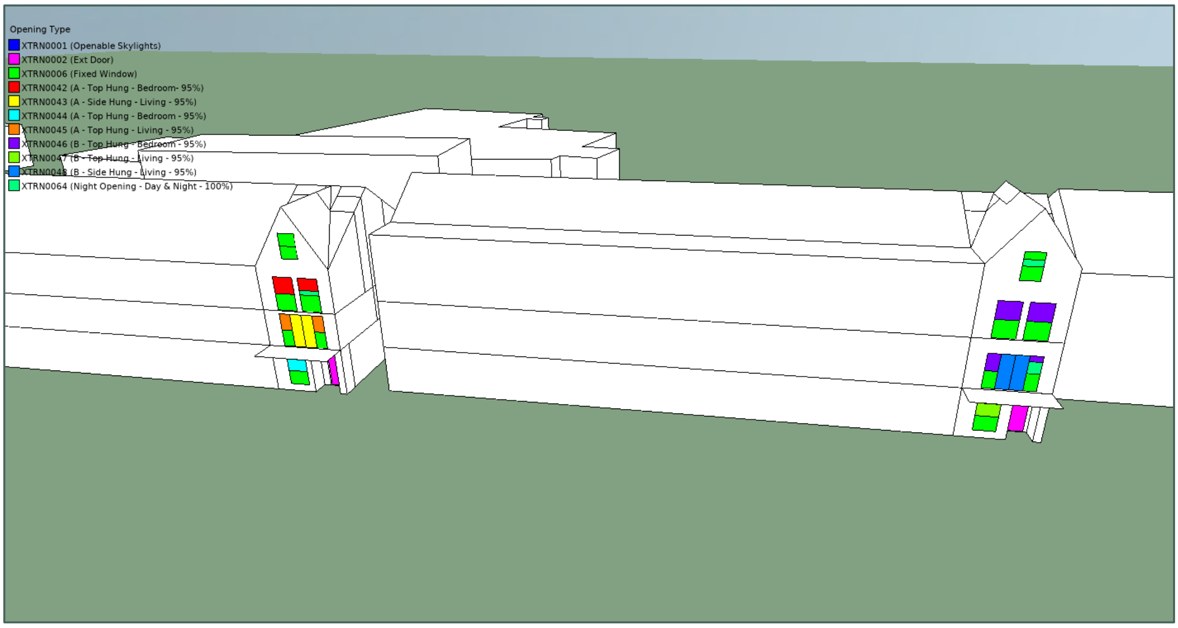


Figure 14 - Opening Types applied within the blocks T1 and T2 (view from West Elevation)

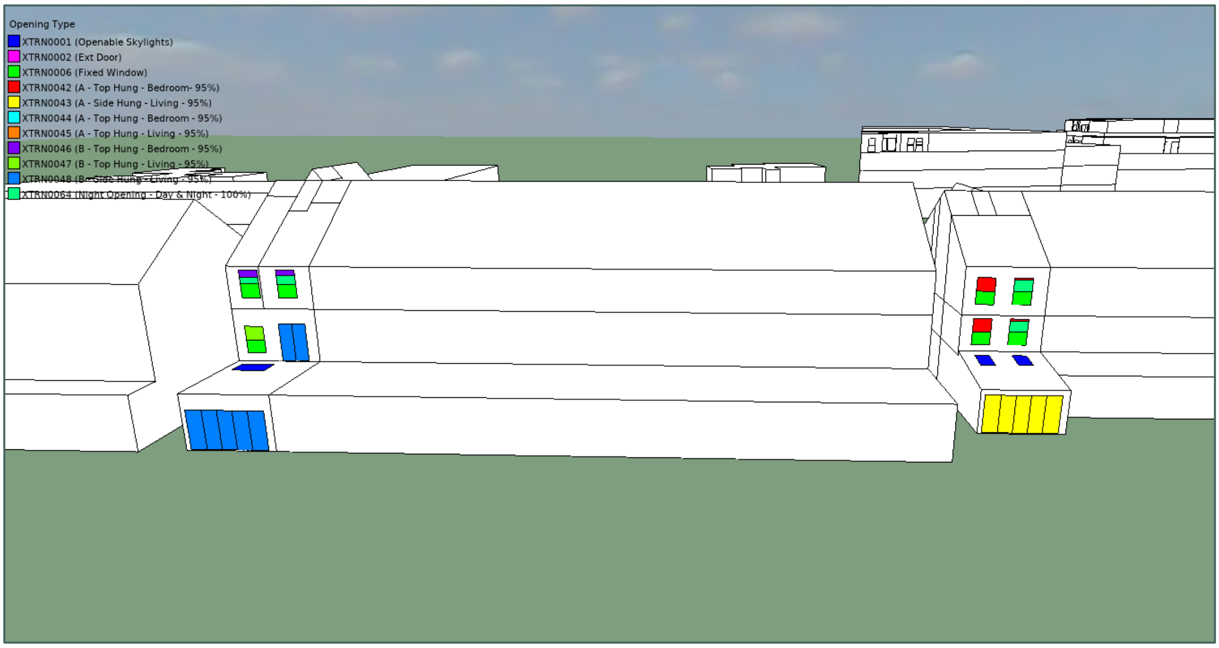


Figure 15 - Opening Types applied within the blocks T1 and T2 (view from East Elevation)

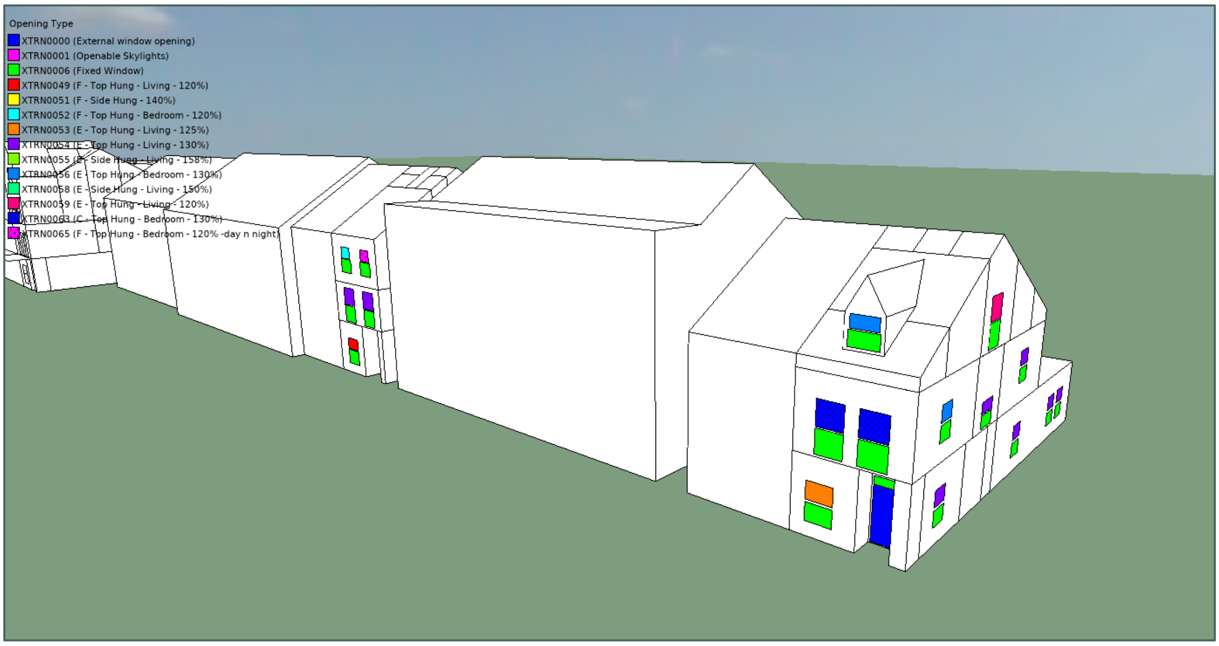


Figure 16 - Opening Types applied within the blocks T3 and Type E (view from Southwest Elevation)

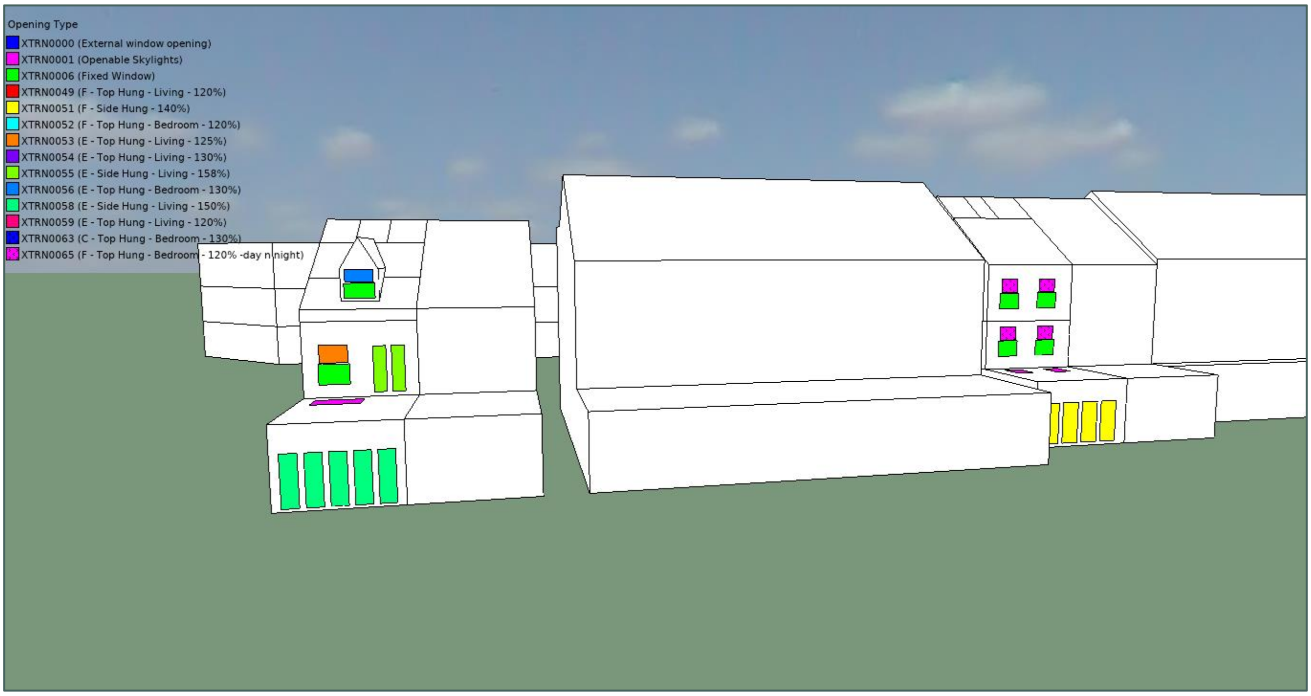


Figure 17 - Opening Types applied within the blocks T3 and Type E (view from East Elevation)

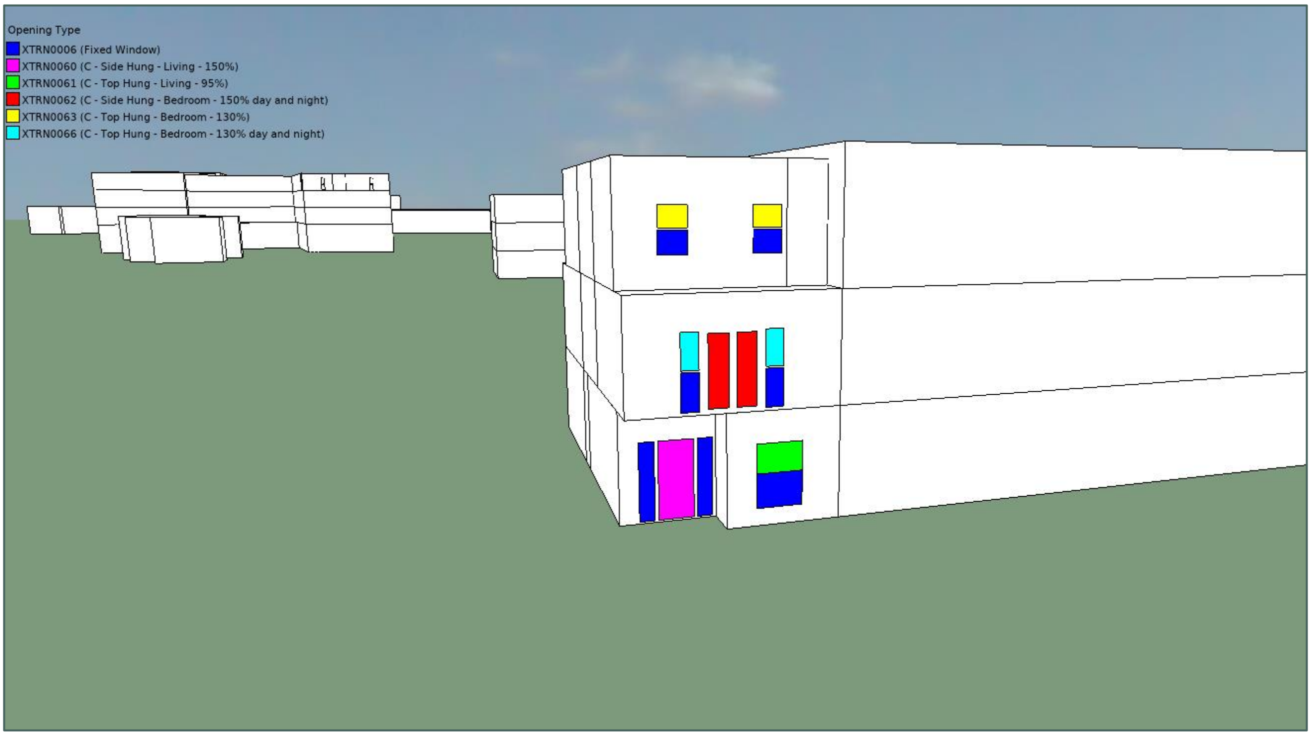


Figure 18 - Opening Types applied within the Block T5 (view from South Elevation)

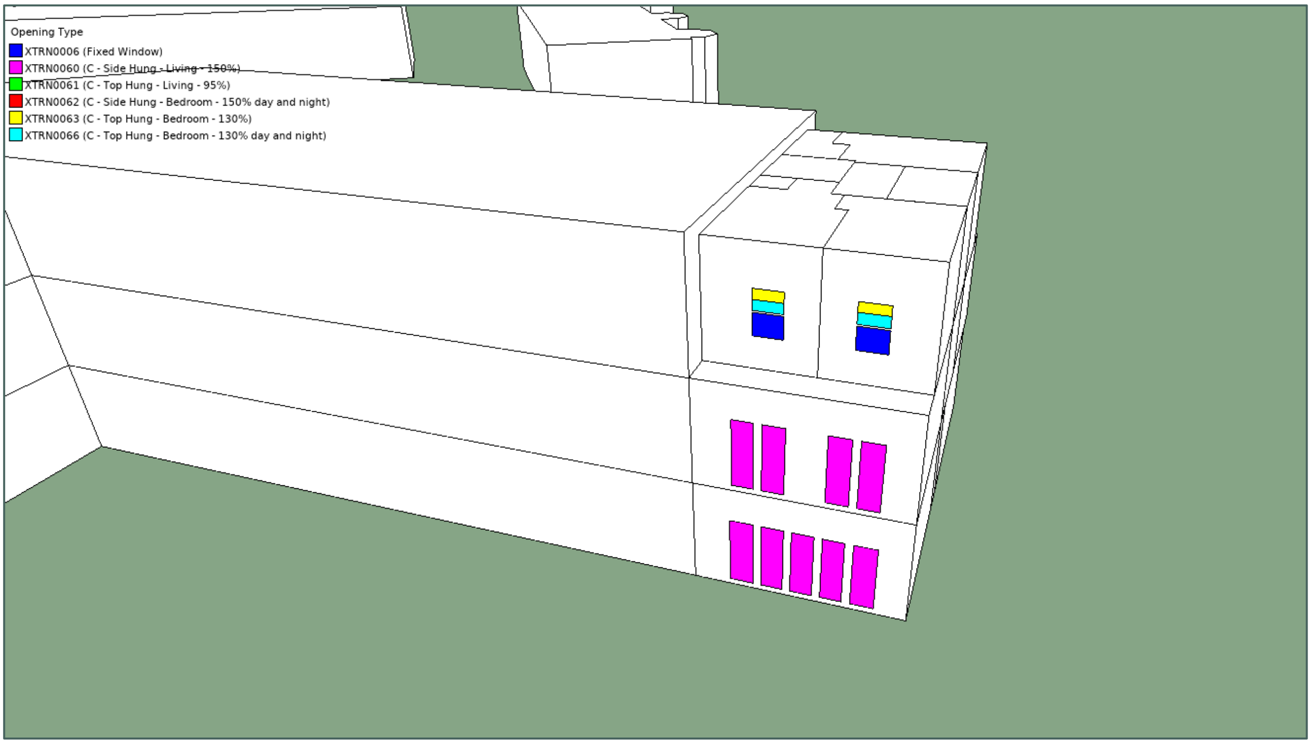


Figure 19 - Opening Types applied within the Block T5 (view from North Elevation)

3.5 Shading devices

Although internal blinds can be applied to all non-openable windows to reduce solar gains during the daytime, this has not been modelled as per Part O1 guidance. Overhangs and balconies have been modelled as per the proposed design.

3.6 Space Cooling

In order to comply with the acoustic requirements, it is not always possible to mitigate the risk of overheating. For units where the proposed passive strategies and MVHR with purge ventilation is not sufficient to reduce the risk of overheating in line with Part O standards, active cooling will be proposed.

3.7 Weather File

The thermal comfort analysis is conducted under both current and projected future climate conditions in accordance with CIBSE TM59 requirements, based on the below weather files:

Current condition:

- London GTW DSY1 2020s high emissions 50th percentile

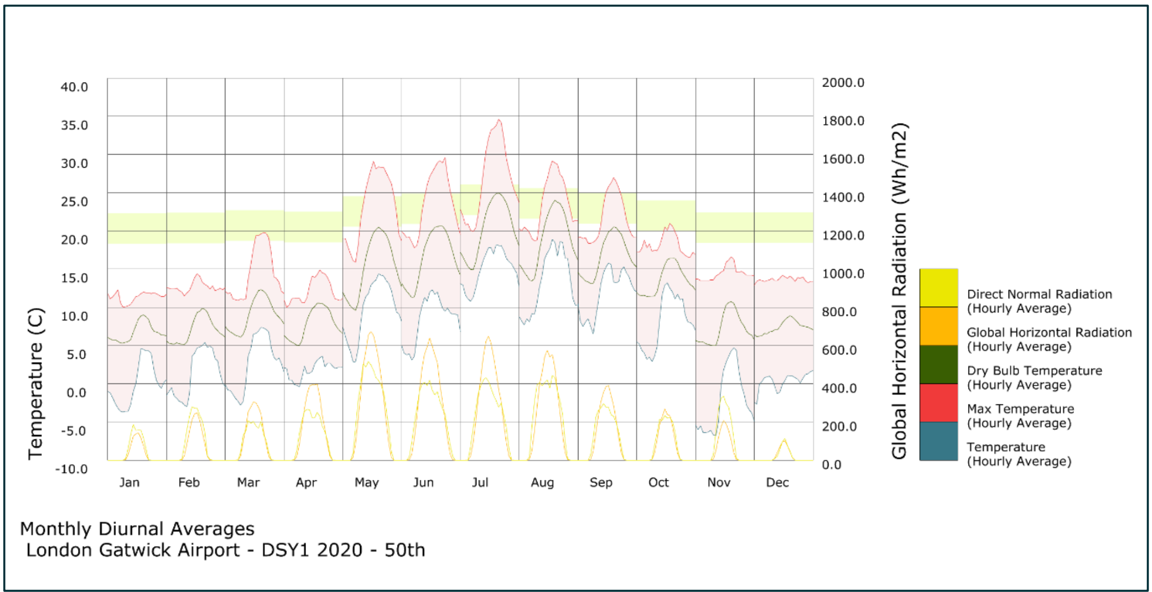


Figure 20 - Monthly diurnal averages, whole year, DSY1 2020, high emissions, 50th percentile weather file

Future condition:

- London GTW DSY1 2050s high emissions 50th percentile

The solar gains are calculated from the IES software based on the weather file, the building's geometry and orientation of its facades, surrounding obstacles, transmission coefficients of the glazing and the solar angles.

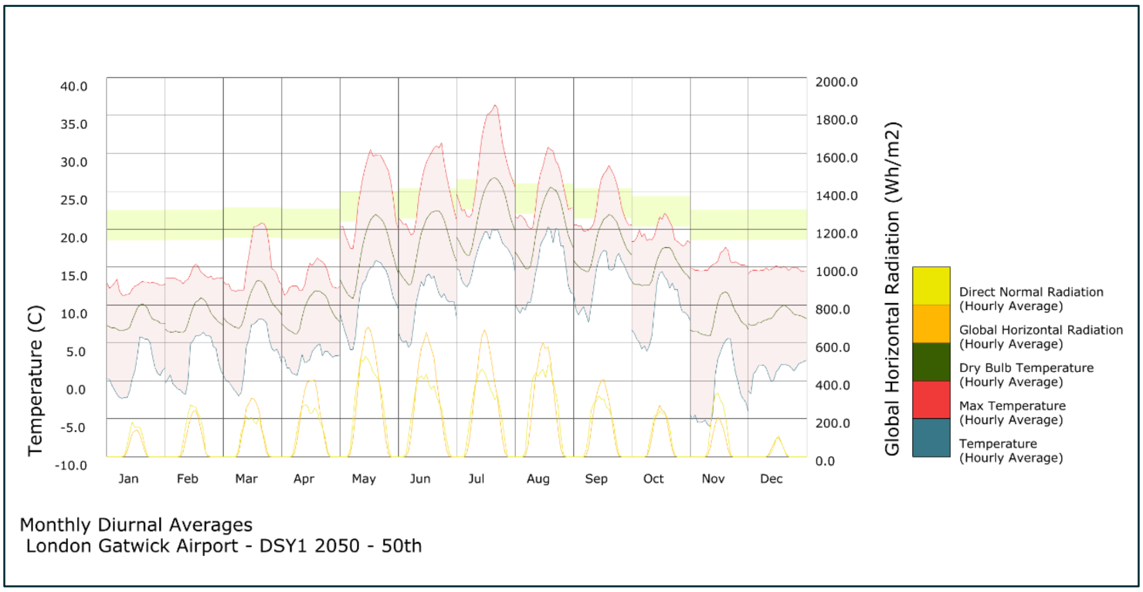


Figure 21 - Monthly diurnal averages, whole year, DSY1 2050, high emissions, 50th percentile weather file.

Results

4.0 Results

According to CIBSE TM59, the overheating assessment has been undertaken for the summer period, from 1st May to 30th September. The air speed is set at 0.1 m/s to generate operative temperature, and the thermal comfort category is assumed to be Category II (new building) in the assessment. Dynamic thermal simulation has been conducted with the settings described in Section 3.0. Results for both the current and future weather conditions are presented in this section.

4.1 Current Weather File – DSY1 2020

Results for current weather conditions using London Gatwick DSY1 2020 are presented in this section.

Results for the assessed occupied spaces under the current weather file with mixed-mode ventilation (openable windows and MVHR) are shown in Table 6 below.

Units	Space	Criterion 1 (% hours top-max>=1K)	Criterion 2 (hours operative temp. >26°C)	Pass / Fail
Block 1 – B1-70d (Second Floor)	Bedroom 1	2.4	35	Fail
	Bedroom 2	2.4	34	Fail
	Living/Kitchen/Dining	3.9	-	Fail
Block 1 – B1-61d (Third Floor)	Bedroom 1	1.5	24	Pass
	Bedroom 2	2.2	20	Pass
	Living/Kitchen/Dining	3.9	-	Fail
Block 2 – B2-70a (Third Floor)	Bedroom 1	1.7	27	Pass
	Bedroom 2	2.2	31	Pass
	Living/Kitchen/Dining	3.9	-	Fail
Block 3 – B3-70a (First Floor)	Bedroom 1	3.3	43	Fail
	Bedroom 2	2.2	28	Pass
	Living/Kitchen/Dining	3.2	-	Fail
Block 3 – B3-61a (Third Floor)	Bedroom 1	1.4	25	Pass
	Bedroom 2	1.9	18	Pass
	Living/Kitchen/Dining	3.3	-	Fail
T1 – HT A3 (Plot 59)	Bedroom 1	0.8	18	Pass

Units	Space	Criterion 1 (% hours top-max>=1K)	Criterion 2 (hours operative temp. >26°C)	Pass / Fail
	Bedroom 2	2.9	24	Pass
	Bedroom 3	0.7	20	Pass
	Bedroom 4	0.6	32	Pass
	Living	3.7	-	Fail
	Kitchen/Dining	2.2	-	Pass
T2 – HT B1 (Plot 67)	Bedroom 1	1.6	20	Pass
	Bedroom 2	1.7	29	Pass
	Bedroom 3	0.8	28	Pass
	Bedroom 4	1.4	27	Pass
	Living	2.3	-	Pass
	Kitchen/Dining/Family	2	-	Pass
	Snug	2.1	-	Pass
T3 – HT F (Plot 79)	Bedroom 1	0.7	14	Pass
	Bedroom 2	1.1	24	Pass
	Bedroom 3	0.6	16	Pass
	Living	2.8	-	Pass
	Kitchen/Dining/Family	1.9	-	Pass
	Reception Room	1.7	-	Pass
HT E - (Plot 85)	Bedroom 1	1.4	17	Pass
	Bedroom 2	0.9	26	Pass
	Bedroom 3	1	24	Pass
	Living	2.2	-	Pass
	Kitchen/Dining/Family	2.4	-	Pass
	Snug	2.1	-	Pass

Units	Space	Criterion 1 (% hours top-max>=1K)	Criterion 2 (hours operative temp. >26°C)	Pass / Fail
T5 – HT C1 (Plot 117)	Principle Suite	0.8	6	Pass
	Bedroom 2	1.2	22	Pass
	Bedroom 3	0.8	28	Pass
	Bedroom 4	1.1	30	Pass
	Drawing Room	1.5	-	Pass
	Kitchen/Dining/Family	1.4	-	Pass
	Study/ Snug	2.2	-	Pass

Table 6 - Simulation results summary for occupied spaces – using the DSY1 2020 future weather file

As demonstrated in the tables above, the majority of the occupied rooms of the Proposed Development pass the assessment under the current weather condition using a combination of passive and active design measures, thus satisfying TM59 requirements and complying with Part O Requirement O1. For some units in Block 1, 2, 3 & T1, the proposed passive and active design measures were not sufficient to reduce the risk of overheating in line with Part O standards whilst complying with the acoustic requirements set by Pulsar Acoustics, therefore active cooling is proposed for these units.

All the spaces are considered to have a constant MVHR flow rate of 10l/s. However, certain spaces failed to meet overheating criteria with this flow rate and hence higher flow rates were explored. Certain spaces could meet the Part O criteria with higher flow rates. Spaces that require a flow rate of 35l/s to achieve comfort conditions are listed in the table below. Spaces that could not pass even with higher flow rates are listed in

Table 7.

Units	Space
Block 1 (Third Floor)	Bedroom 1
	Bedroom 2
Block 3 (First Floor)	Bedroom 2
T1 – HT A3	Bedroom 2
	Bedroom 4
T3 – HT F	Living
	Reception Room

T5 – HT C1	Bedroom 2
	Bedroom 3
	Snug/ Study

Table 7 – Spaces that achieves 'Pass' with an MVHR flow rate of 35l/s.

A sample number of communal corridors with communal heating pipework has been analysed for overheating and the results are provided in Table 8 below:

Units	Space	Total Annual Result (% hours operative temp. >28oC)	Pass / Fail
Block 1 (Second Floor)	Communal Corridor	14.1	Fail
Block 2 (Third Floor)	Communal Corridor	13.8	Fail
Block 6 (Ground Floor)	Communal Corridor	0.7	Pass

Table 8 - Simulation results summary for Communal Corridors – using the DSY1 2020 future weather file

The communal corridors in Block 1 (second floor) and Block 2 (third floor) does not pass the TM59 overheating criteria for corridors based on the number of annual hours for which an operative temperature of 28°C is exceeded. The results are reported in Table 8.

Although a pass in this criteria is not mandatory, measures like improving the insulation on the pipework and installing automated rooflights will help to reduce the risk of overheating in the communal corridors.

Conclusions

5.0 Conclusions

This Thermal Comfort Report has been undertaken by SRE for the proposed development at south of Ascot High Street, Ascot in order to assess the risks of overheating and the thermal comfort conditions in the occupied spaces.

The following passive and active design measures to address summertime overheating have been incorporated into the design of all occupied rooms.

- High performance building fabric
- Solar Control Glass with low g-value of 0.40
- Openable windows and skylights
- Mixed mode ventilation via openable windows and MVHR
- External shading by balconies and overhangs.

The results of the simulations indicate that under current climate conditions (London Gatwick DSY1 2020s high emissions, 50th percentile), the Proposed Development passes the assessment criteria using a combination of passive and active strategies, indicating a good level of thermal comfort during summer periods.

For certain spaces in Block 1, 2, 3 & T1, the proposed passive and active design measures were not sufficient to reduce the risk of overheating in line with Part O standards whilst complying with the acoustic requirements set by Pulsar Acoustics, therefore active cooling is proposed for these units.

An additional simulation was carried out using a future weather file (London Gatwick DSY1 2050s high emissions, 50th percentile) to further test the robustness of the design. The results of the simulation indicate that most of the spaces fail to meet the criteria and measures will need to be taken to mitigate overheating in the future. It should be noted that a pass is not mandatory under the future weather file scenario but is reported to acknowledge the issues that will arise in the future and take the required the measures.

The assessed communal corridors fail except one in both DSY1 2020 and 2050. A pass is not mandatory but measures are to be taken to mitigate overheating in communal corridors with communal heating pipework. All the results are documented in this report.

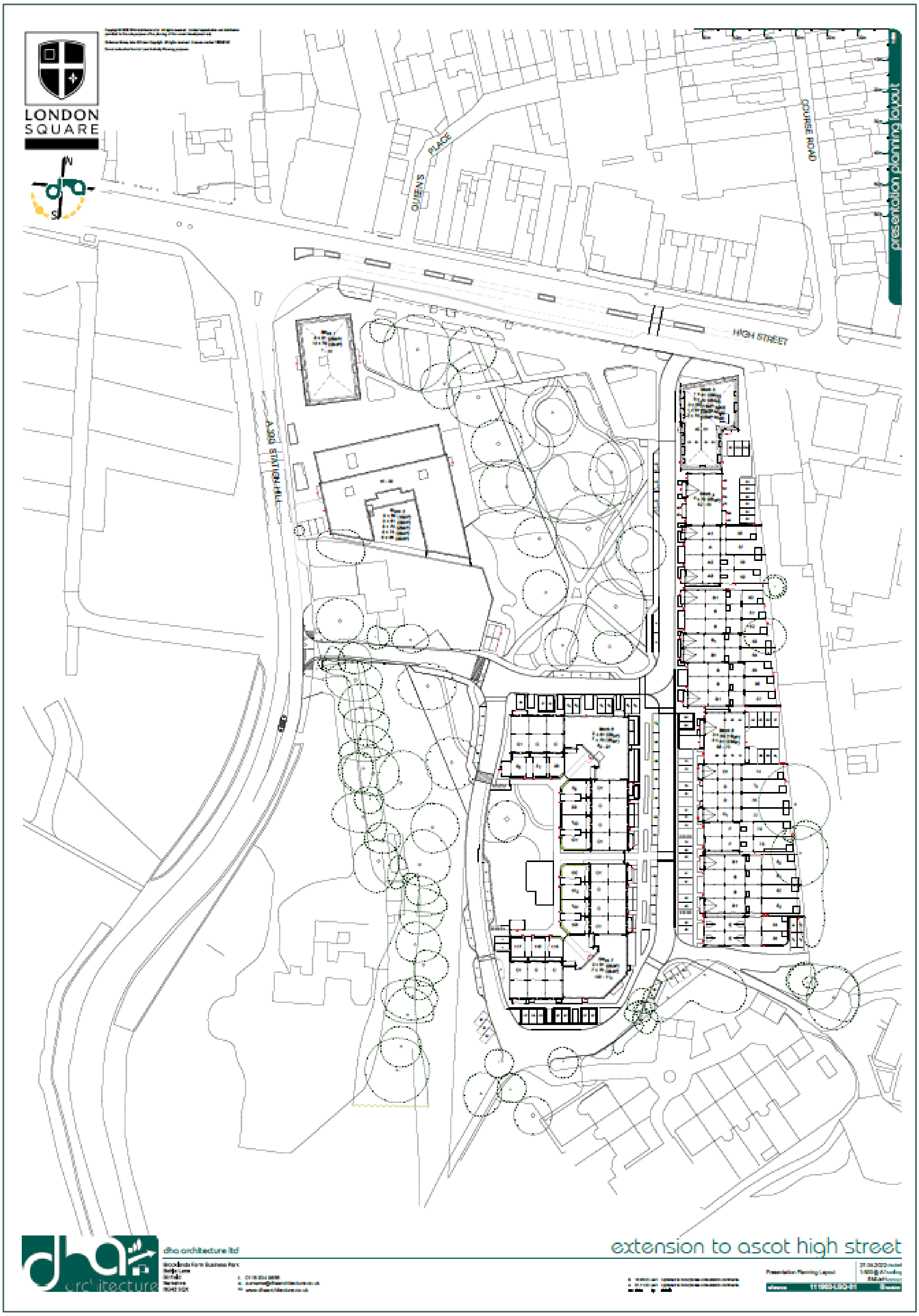
Results from the simulation indicate that a thermally comfortable environment can be expected within the Proposed Development with the proposed design considerations.

In relation to CIBSE TM59 requirements and Building Regulations Part O Requirement O1, the Proposed Development meets the assessment criteria.

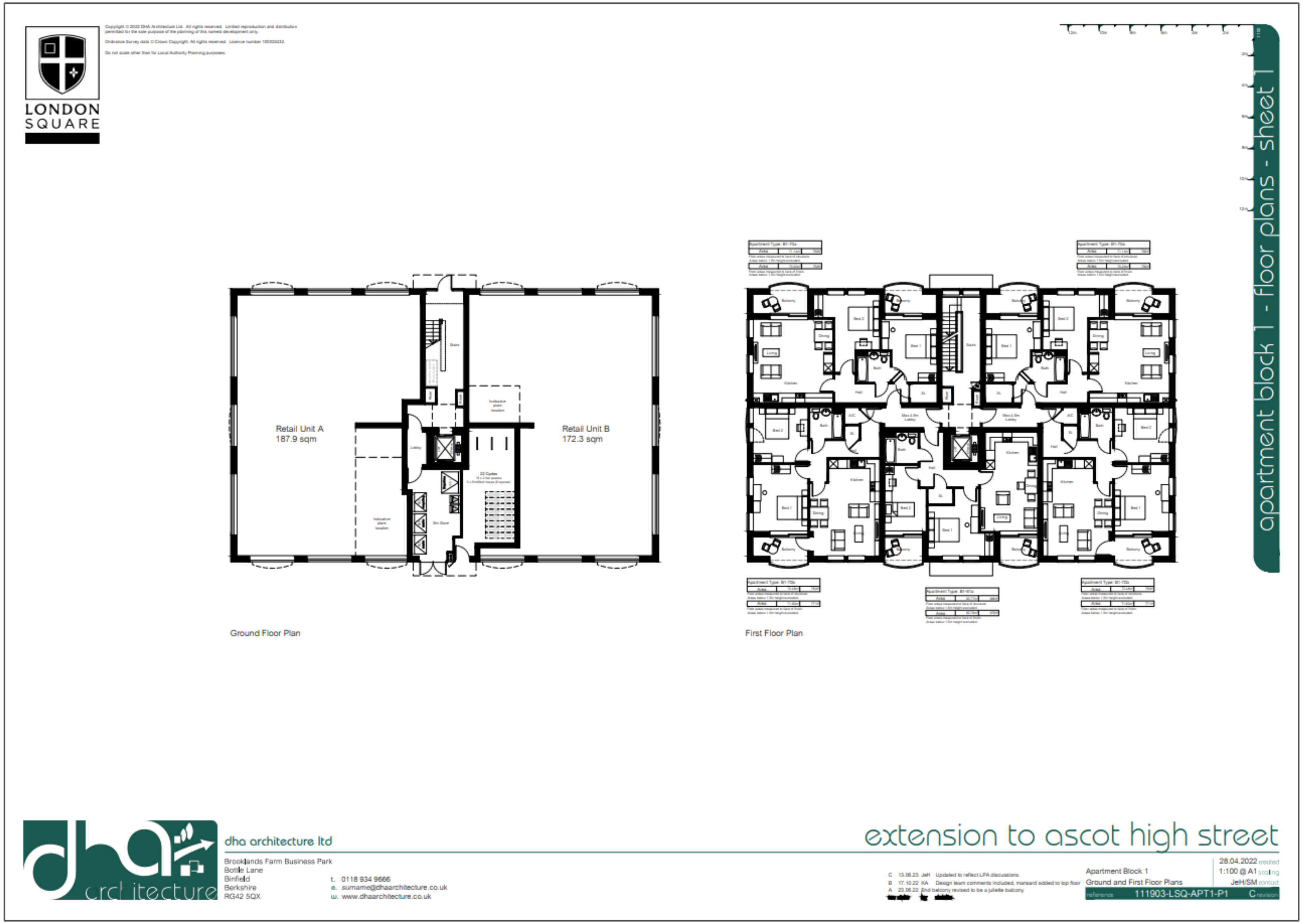
Appendices

Appendix A – Site and Floor Plans

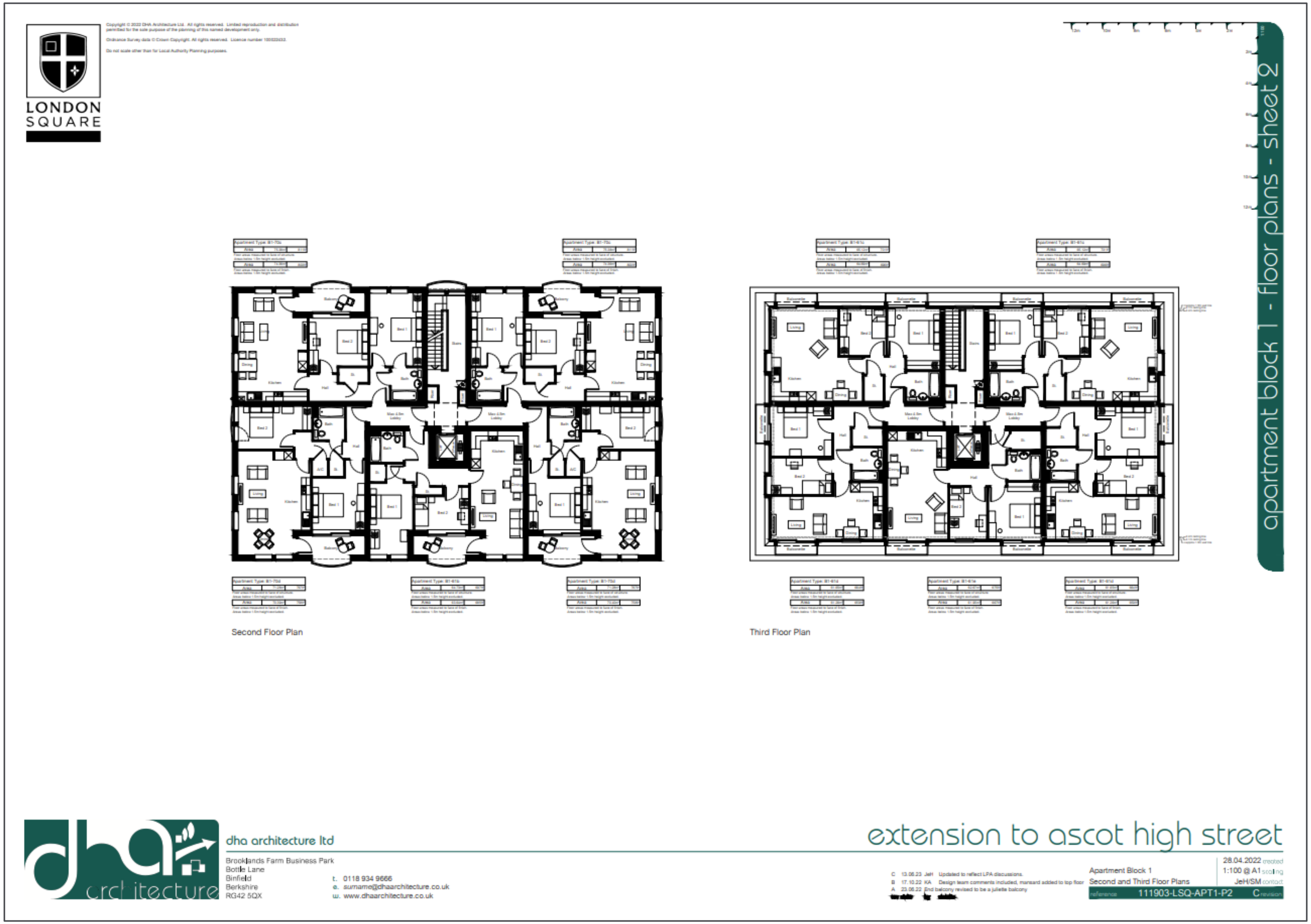
Site Plan



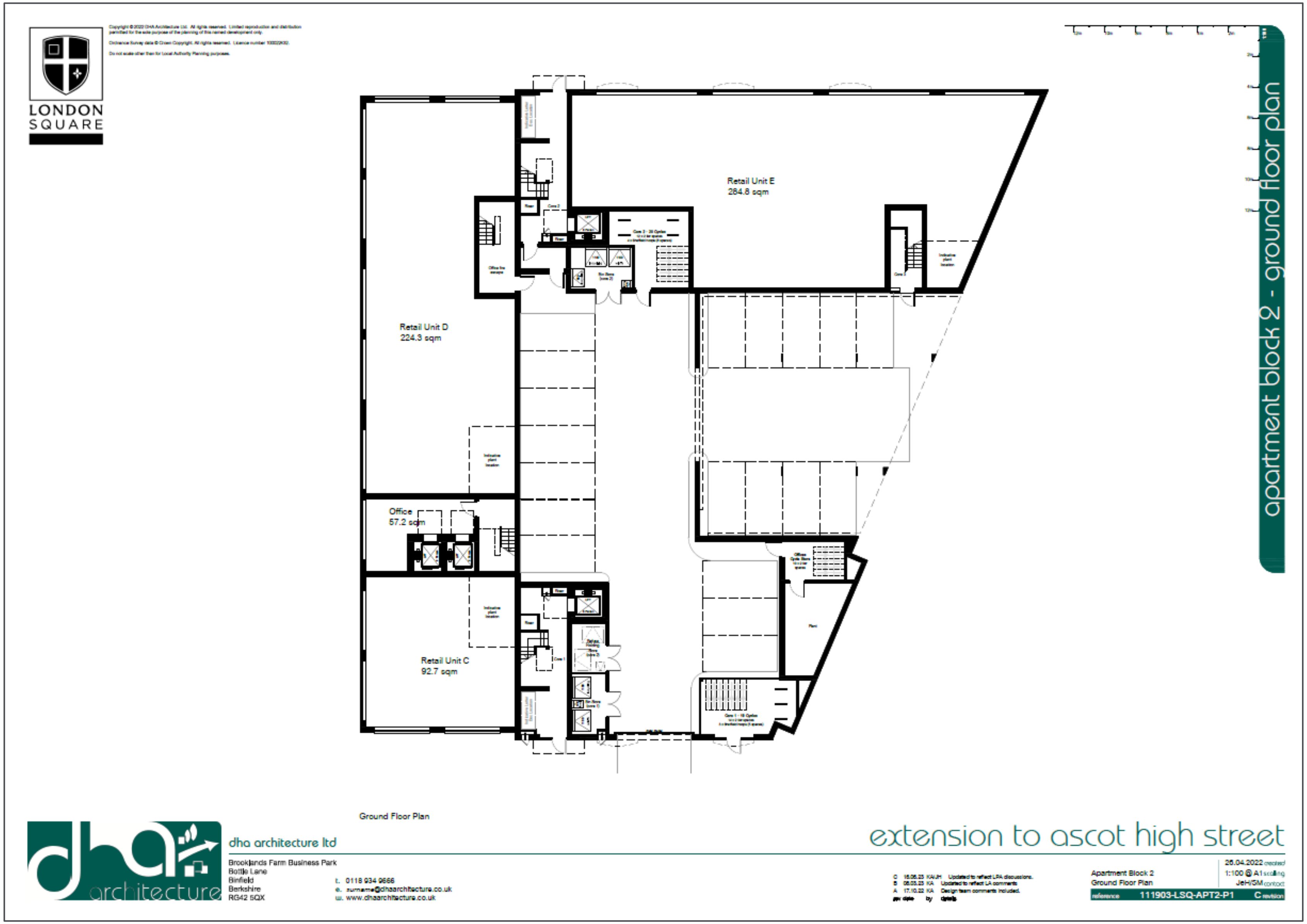
Block 1 – Ground and First Floor Plan



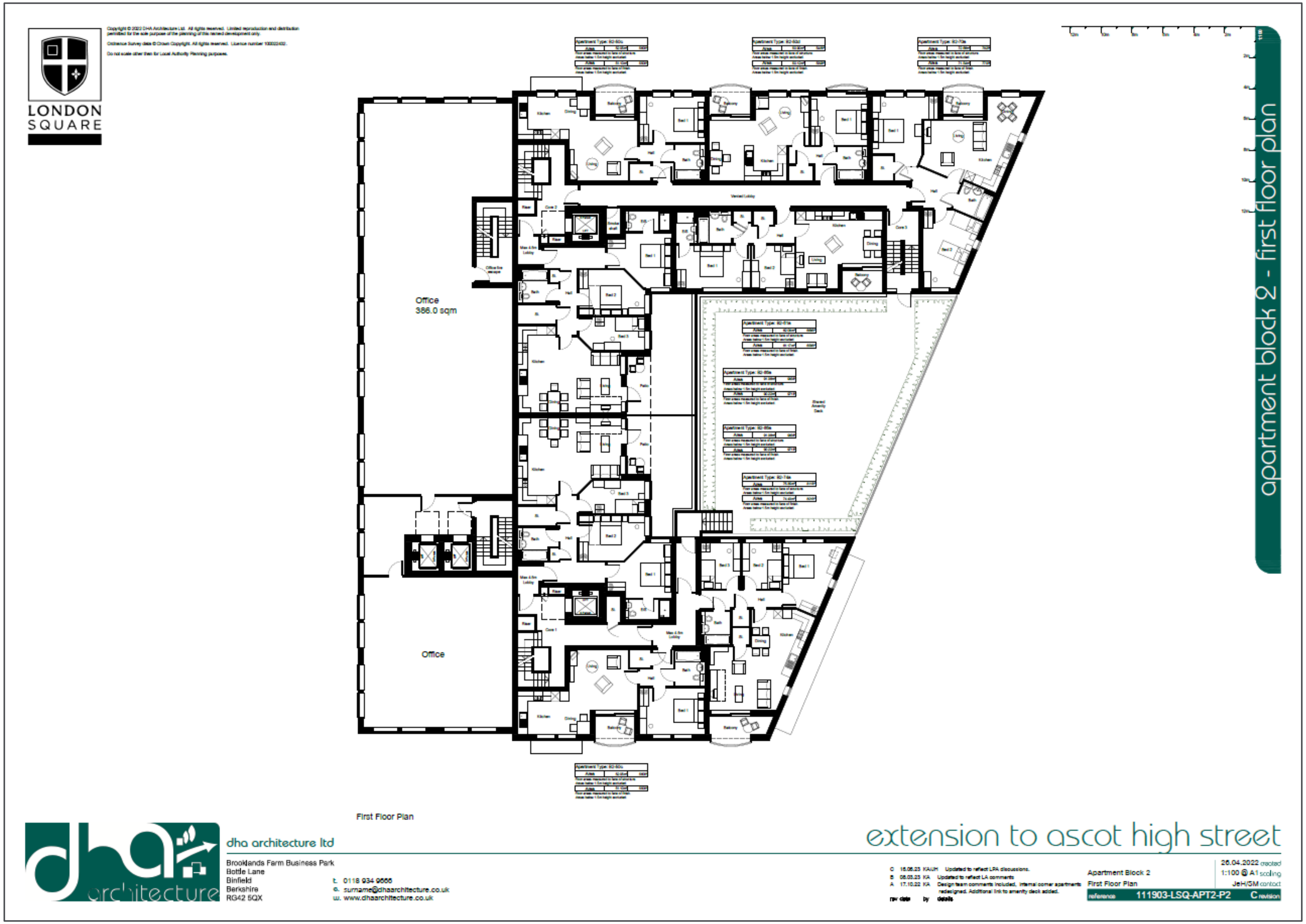
Block 1 – Second and Third Floor Plan



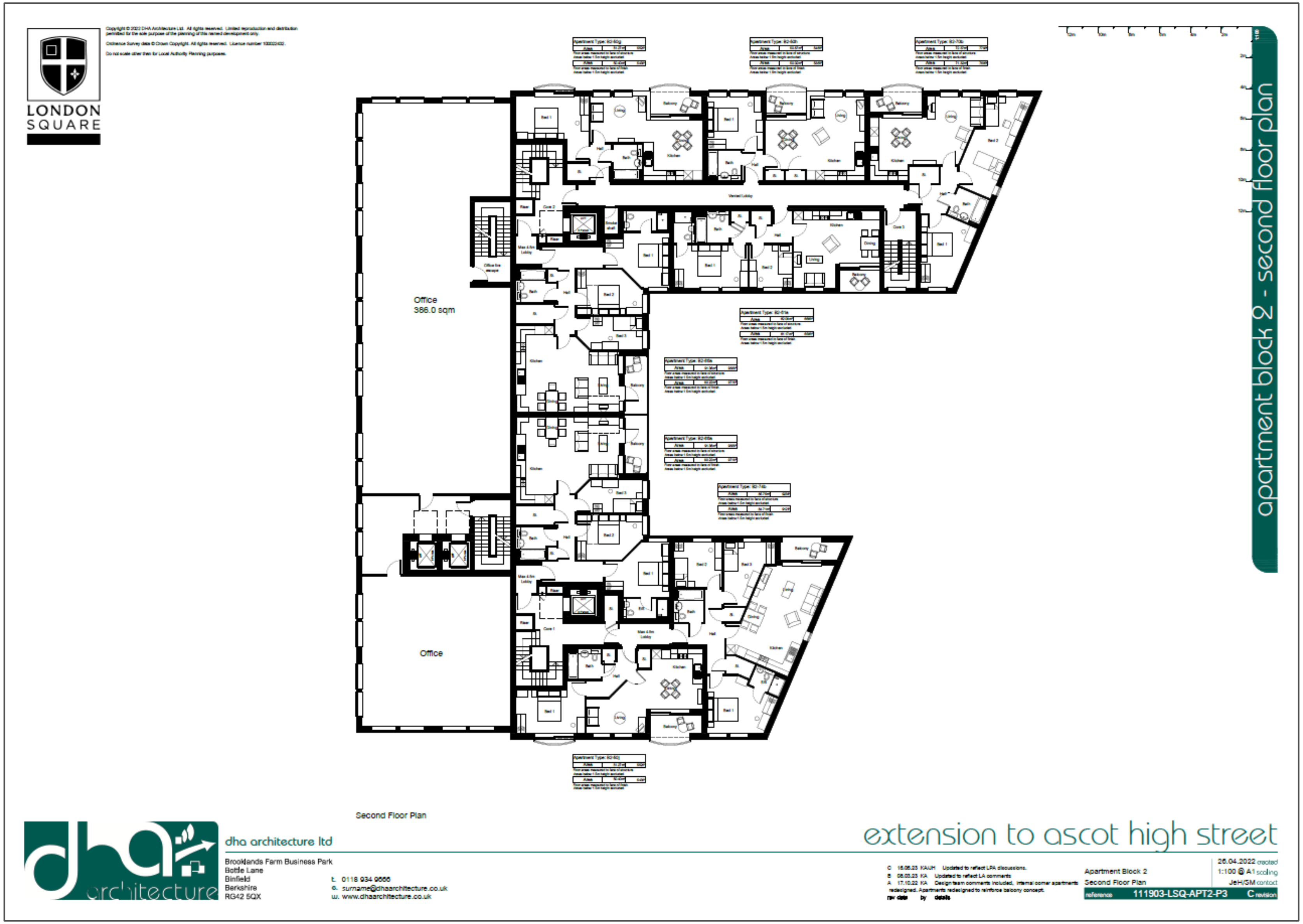
Block 2 – Ground Floor Plan



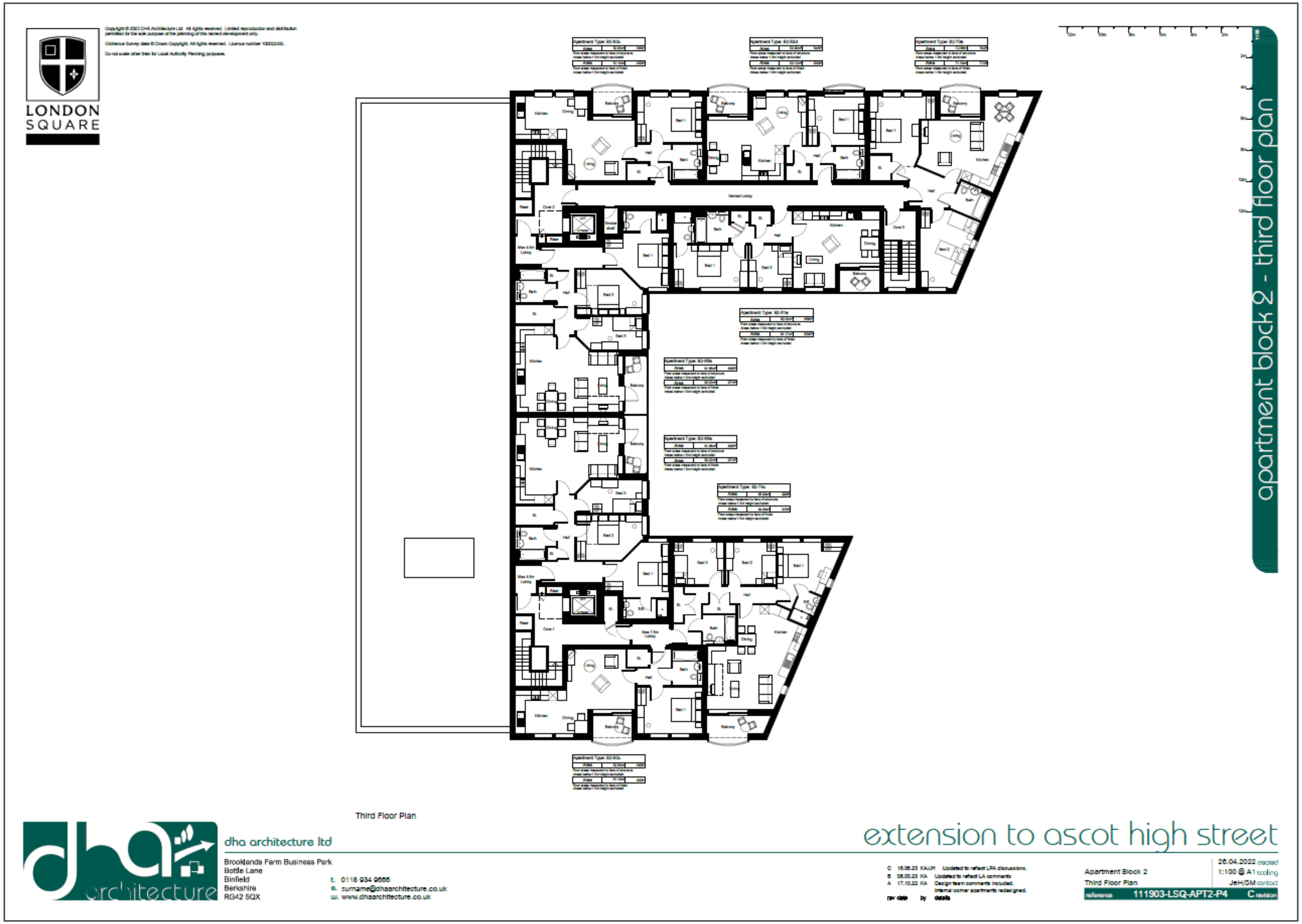
Block 2 – First Floor Plan



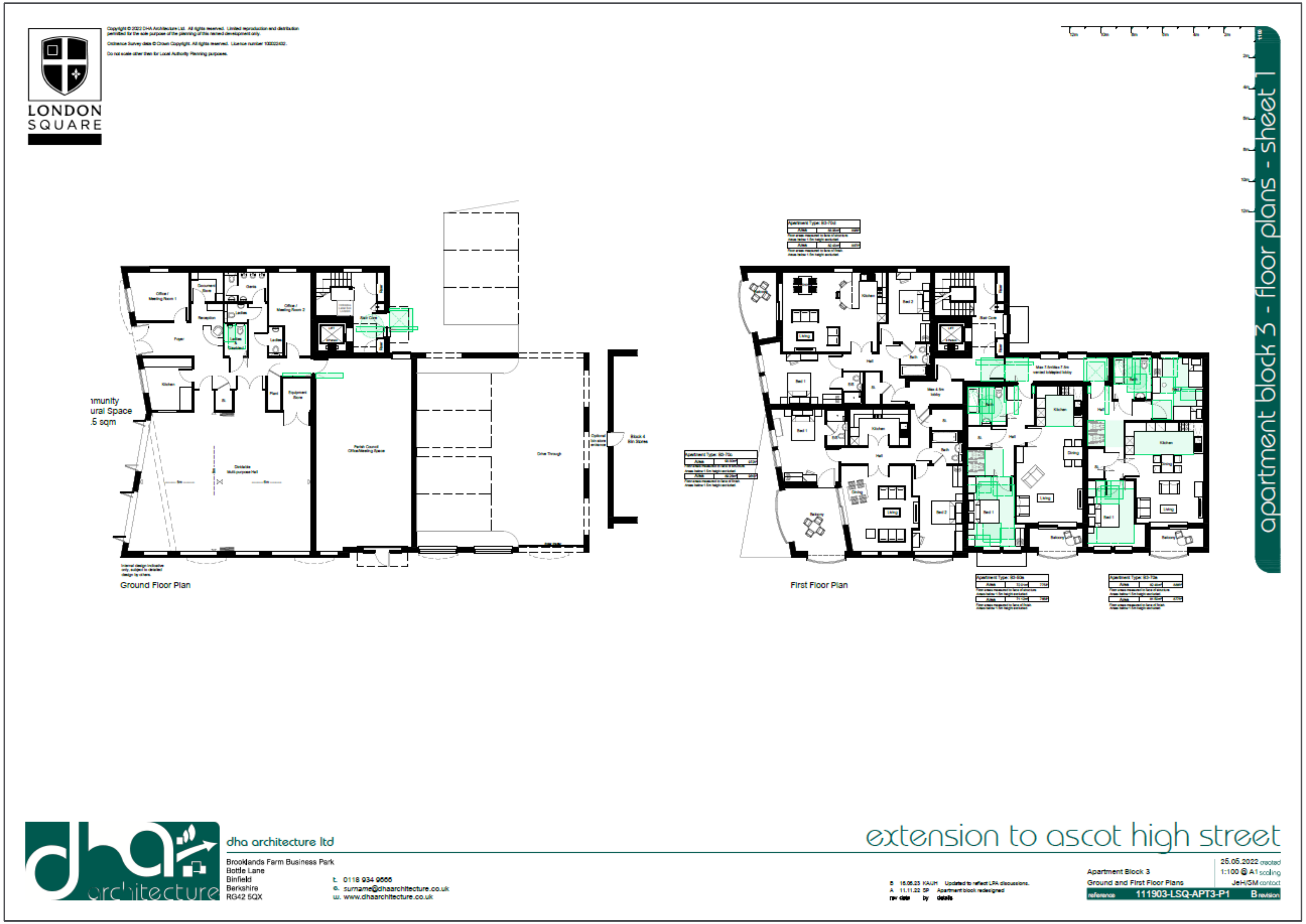
Block 2 – Second Floor Plan



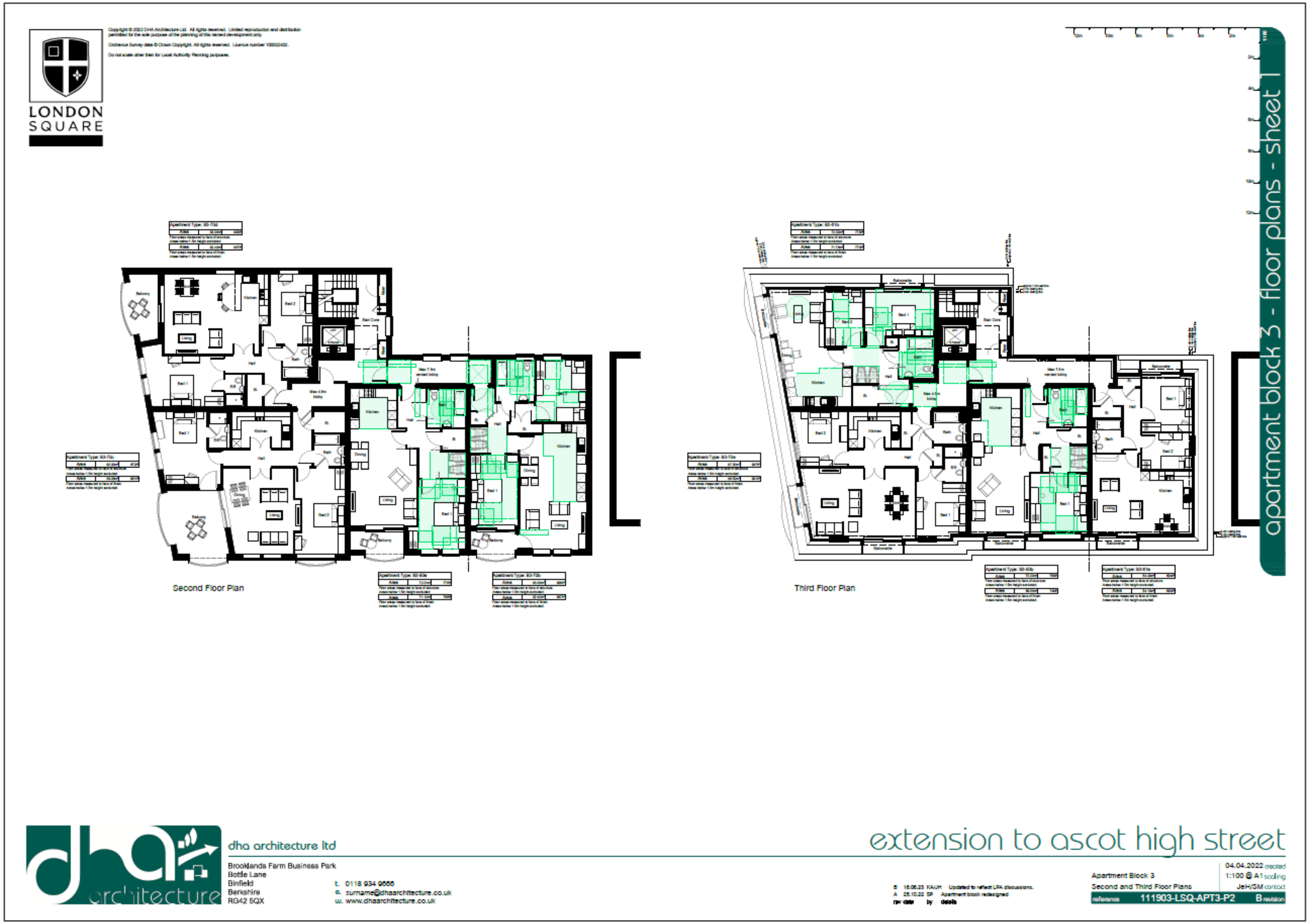
Block 2 – Third Floor Plan



Block 3 – Ground and First Floor Plan



Block 3 – Second and Third Floor Plan



HTE – Floor Plans

LONDON SQUARE

Do not scale other than for Local Authority Planning purposes.

HOUSE TYPE:		E
Ground Floor	73.68m²	793ft²
First Floor	62.92m²	670ft²
Second Floor	40.32m²	434ft²
Total Area	166.92m²	1797ft²

Floor areas measured to face of structure.
Areas below 1.5m height excluded.

Ground Floor	72.67m²	781ft²
First Floor	62.08m²	661ft²
Second Floor	39.89m²	429ft²
Total Area	164.54m²	1771ft²

Floor areas measured to face of finish.
Areas below 1.5m height excluded.

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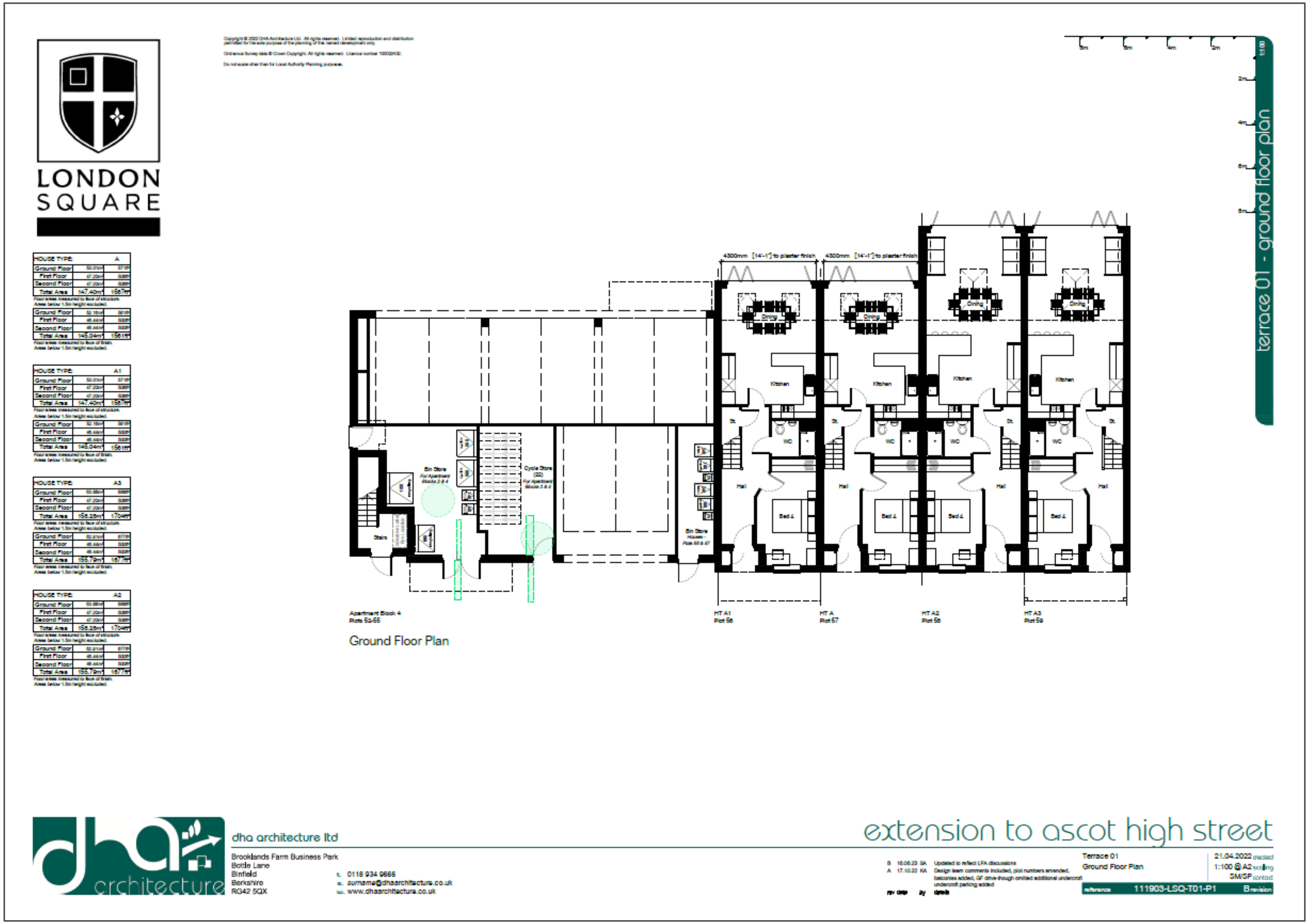
19.05.2023 created
1:100 @ A3 scaling
SM/CC contact

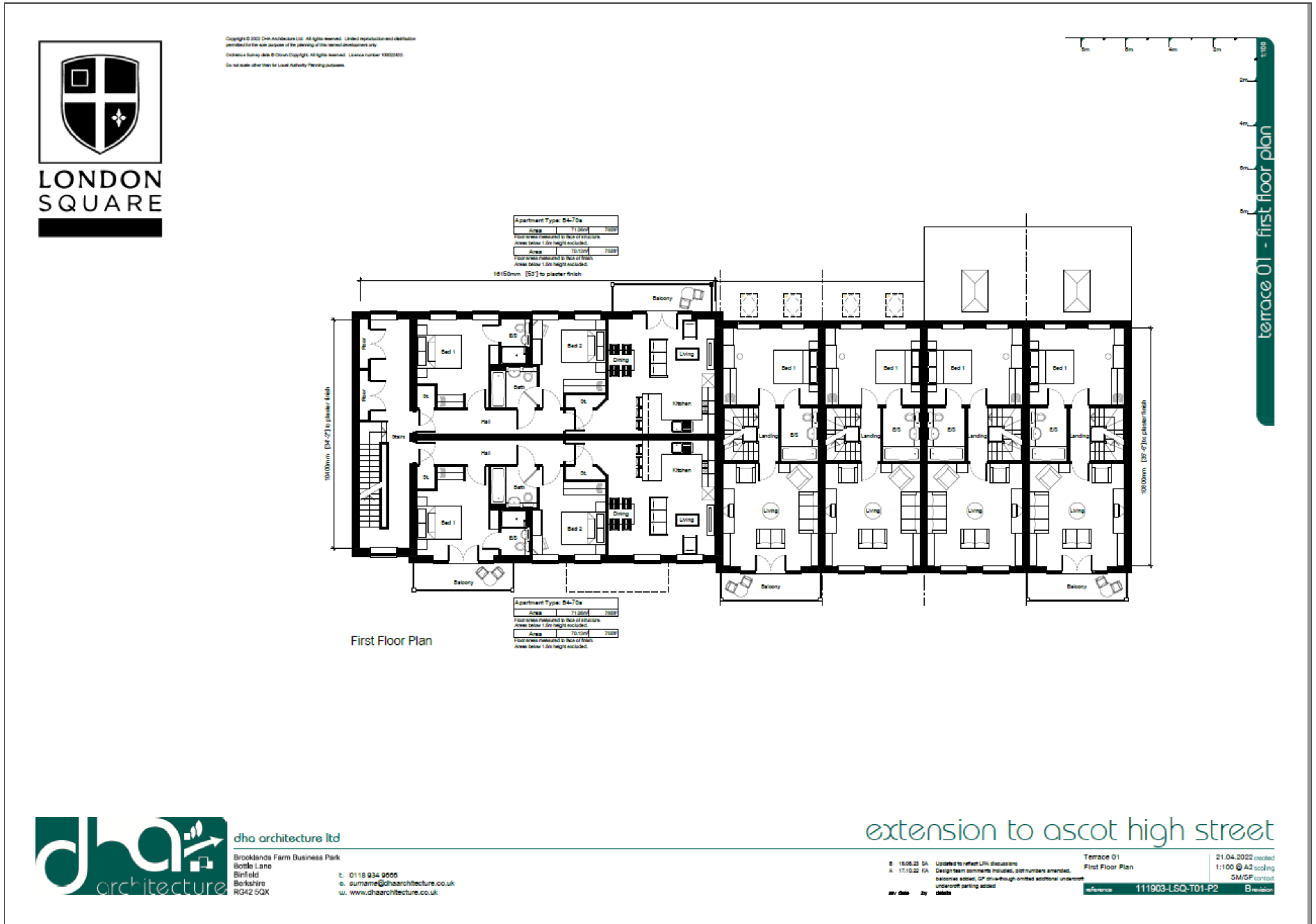
reference 111903-LSQ-HTE-P1 - revision

SRE

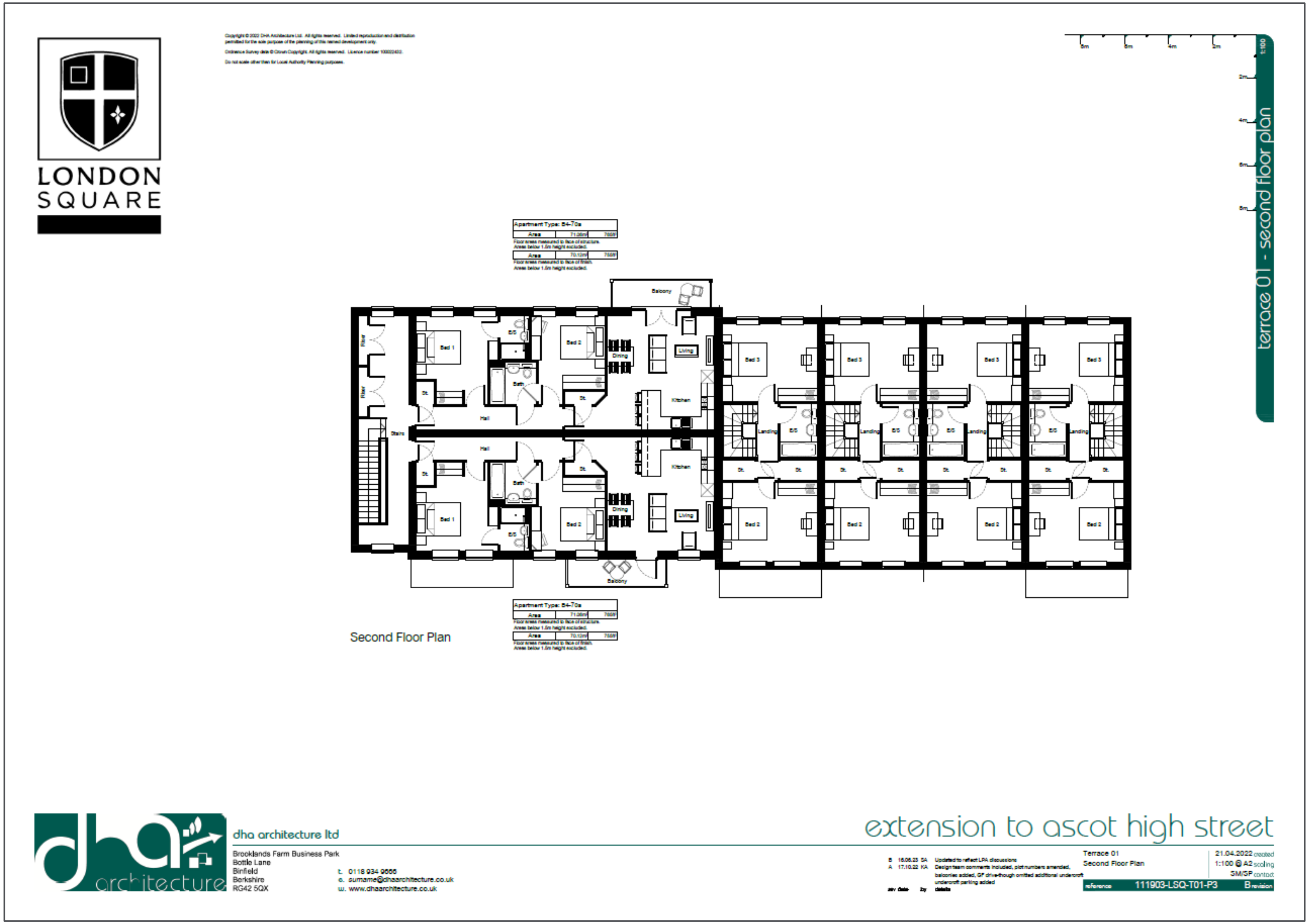
Terrace 01 – Ground Floor Plan



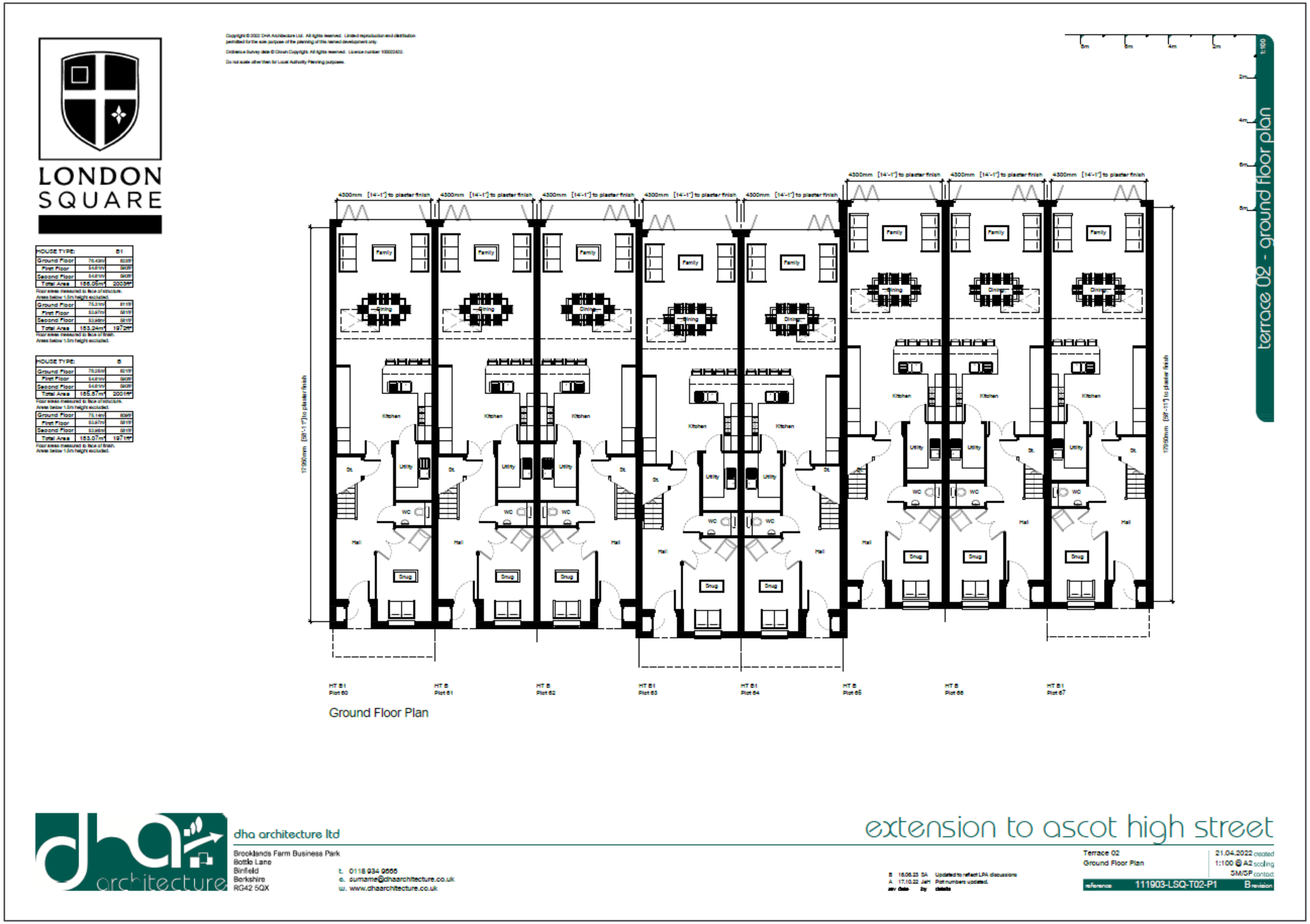
Terrace 01 – First Floor Plan



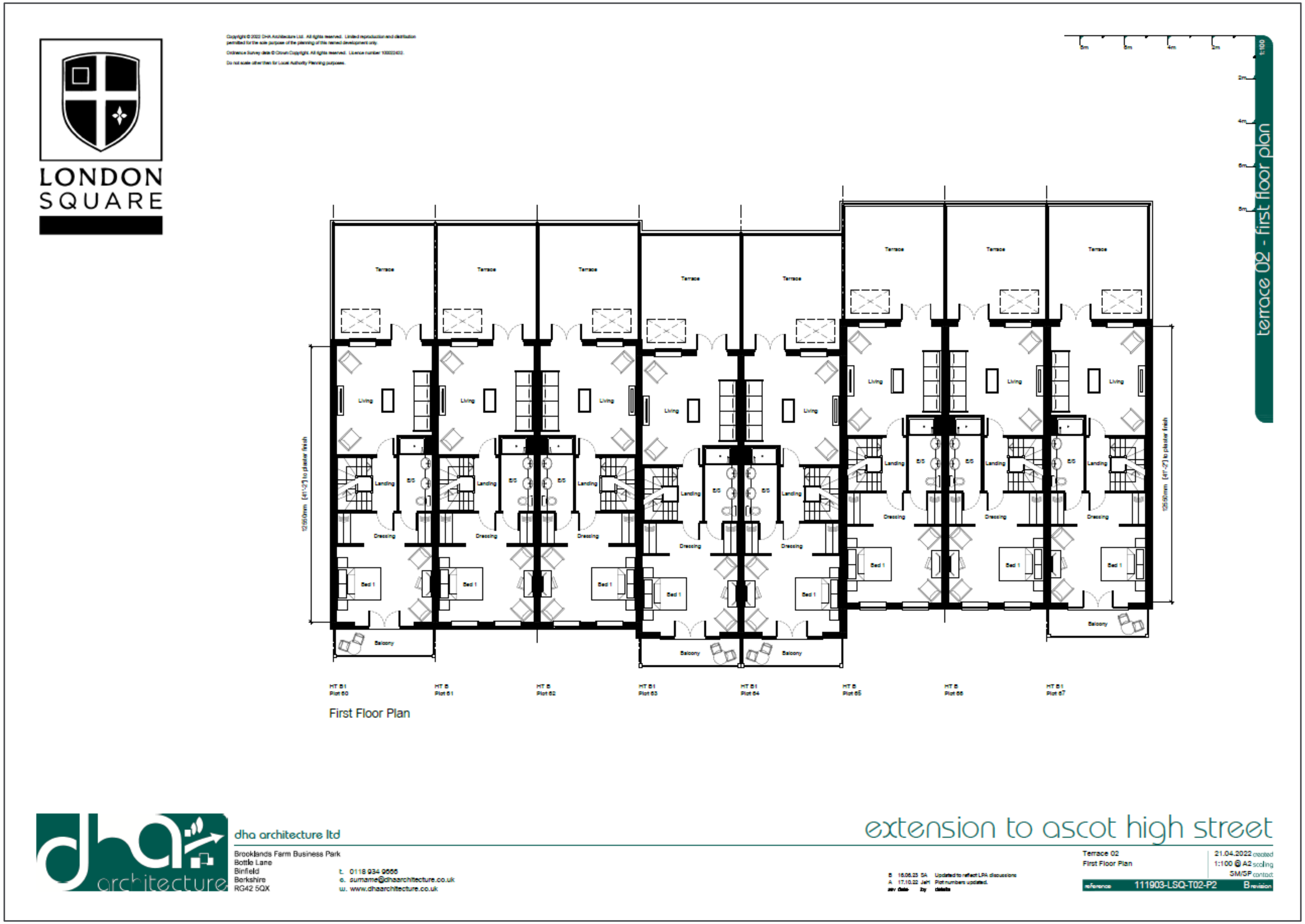
Terrace 01 – Second Floor Plan



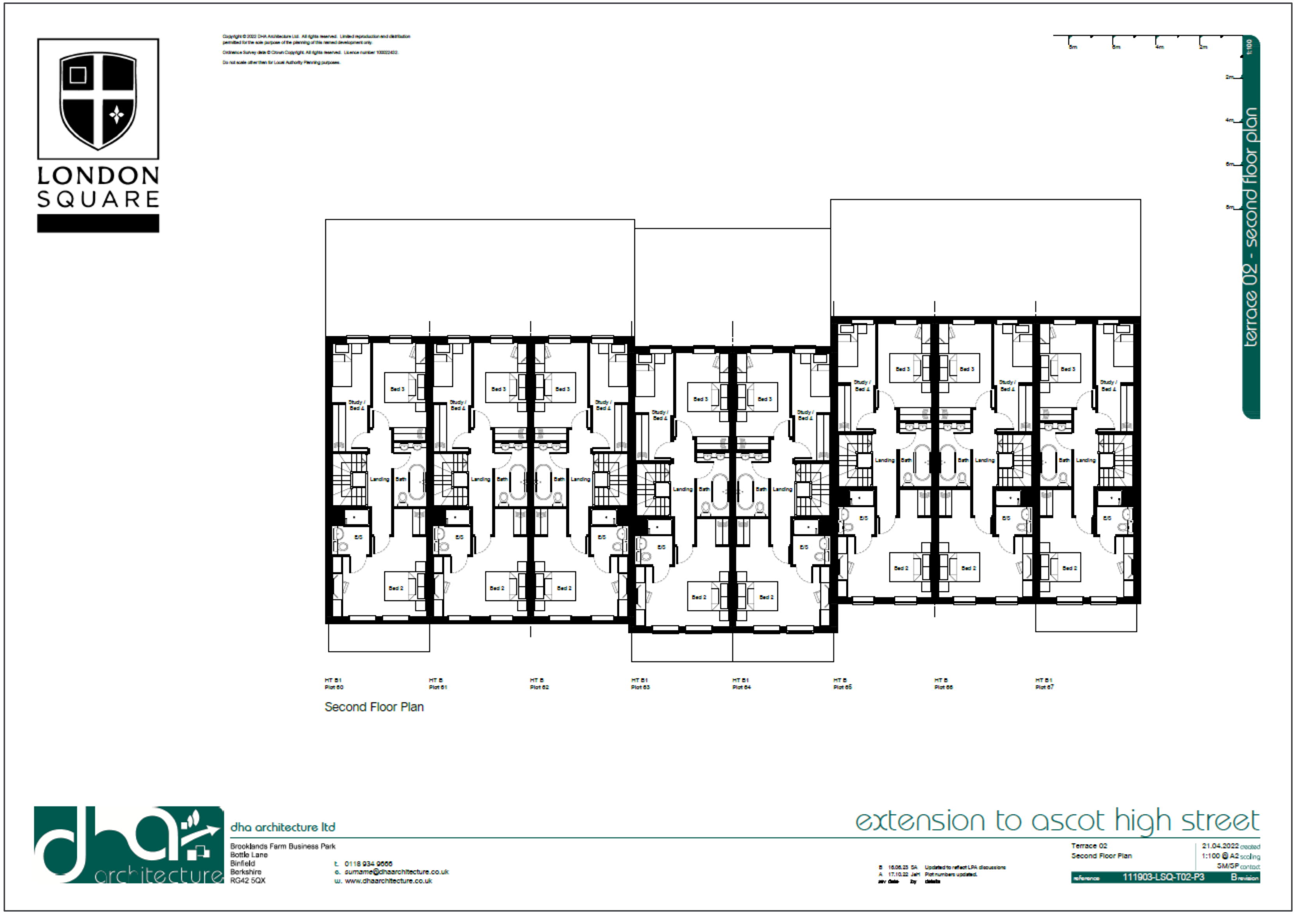
Terrace 02 – Ground Floor Plan



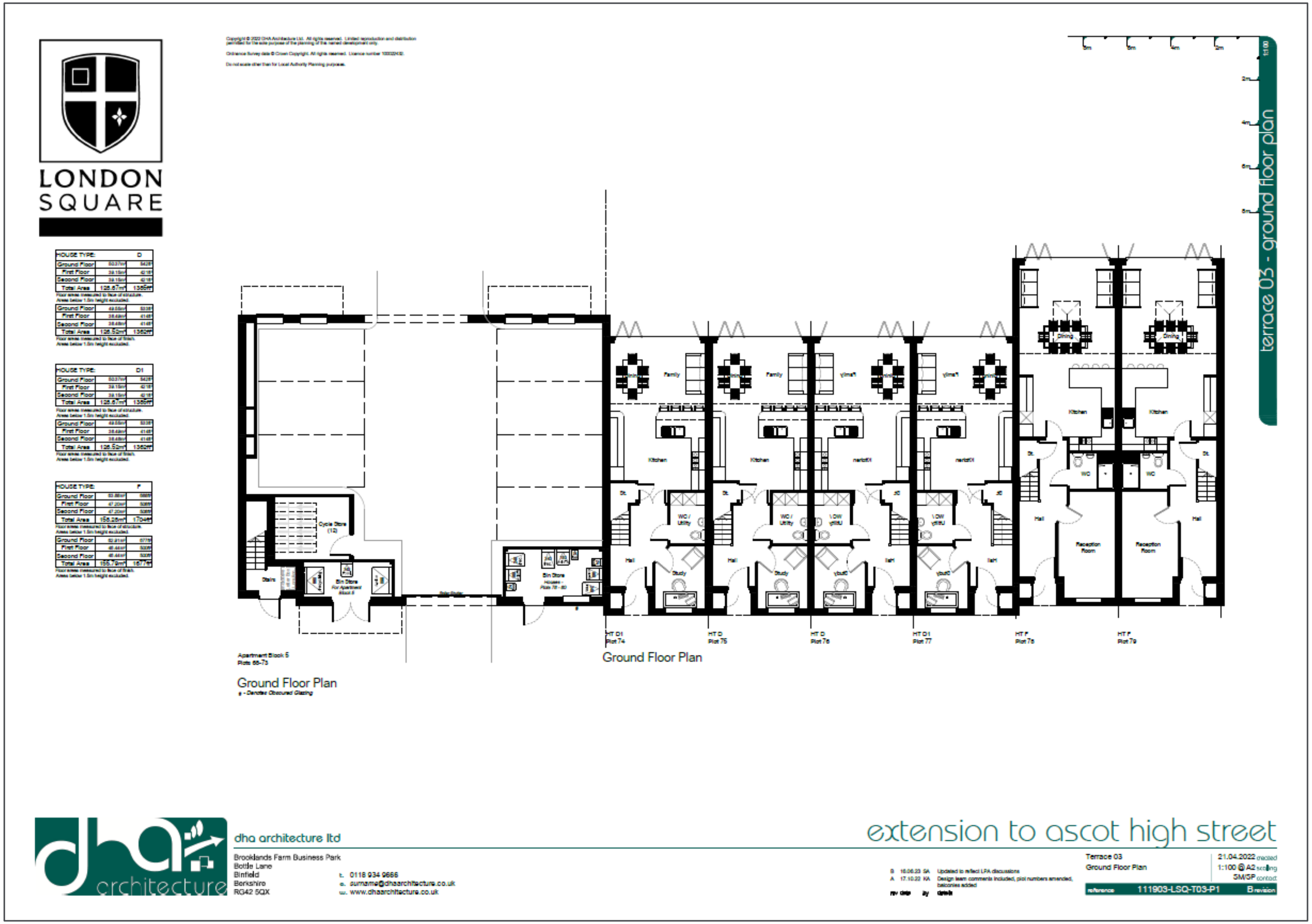
Terrace 02 – First Floor Plan



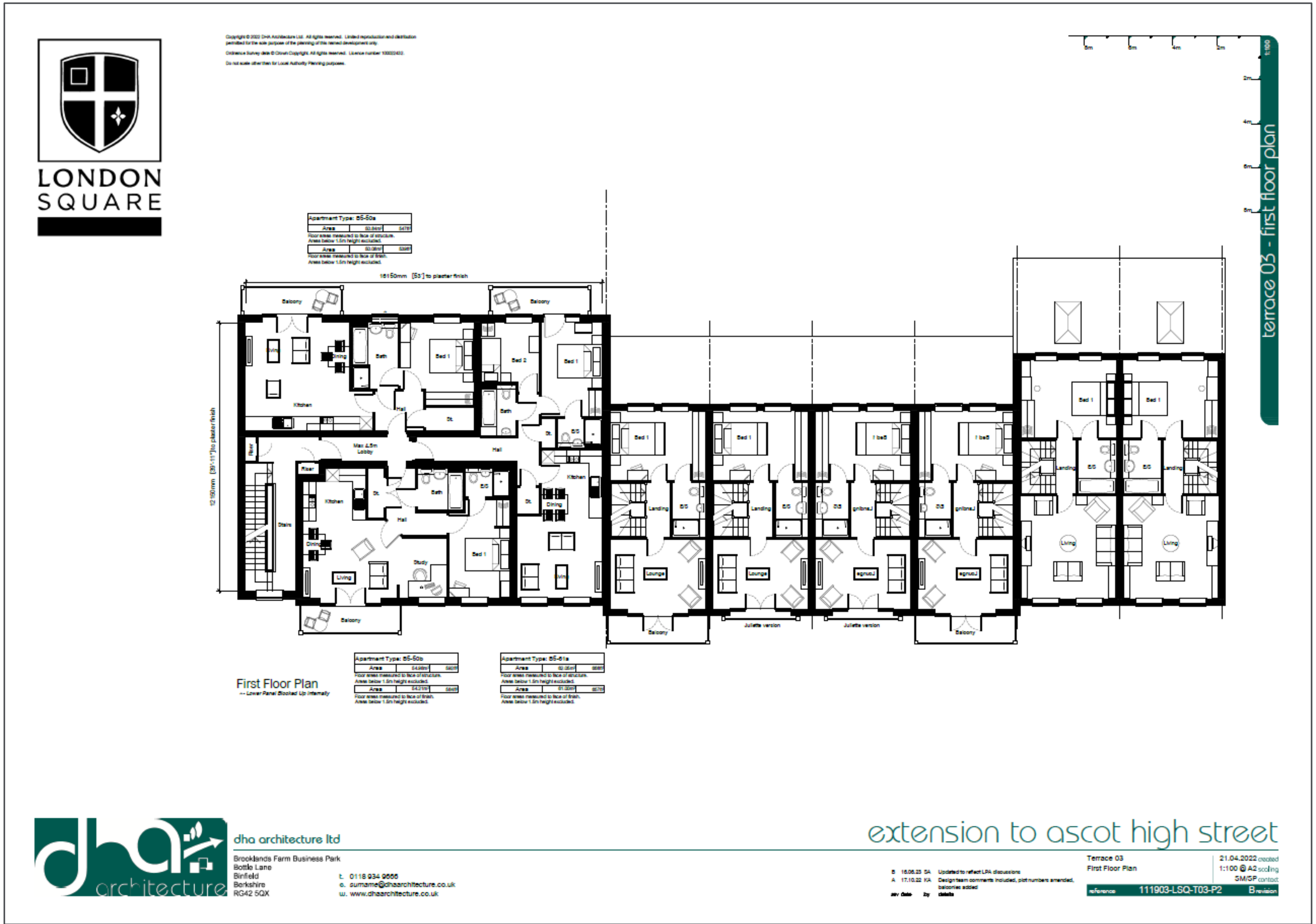
Terrace 02 – Second Floor Plan



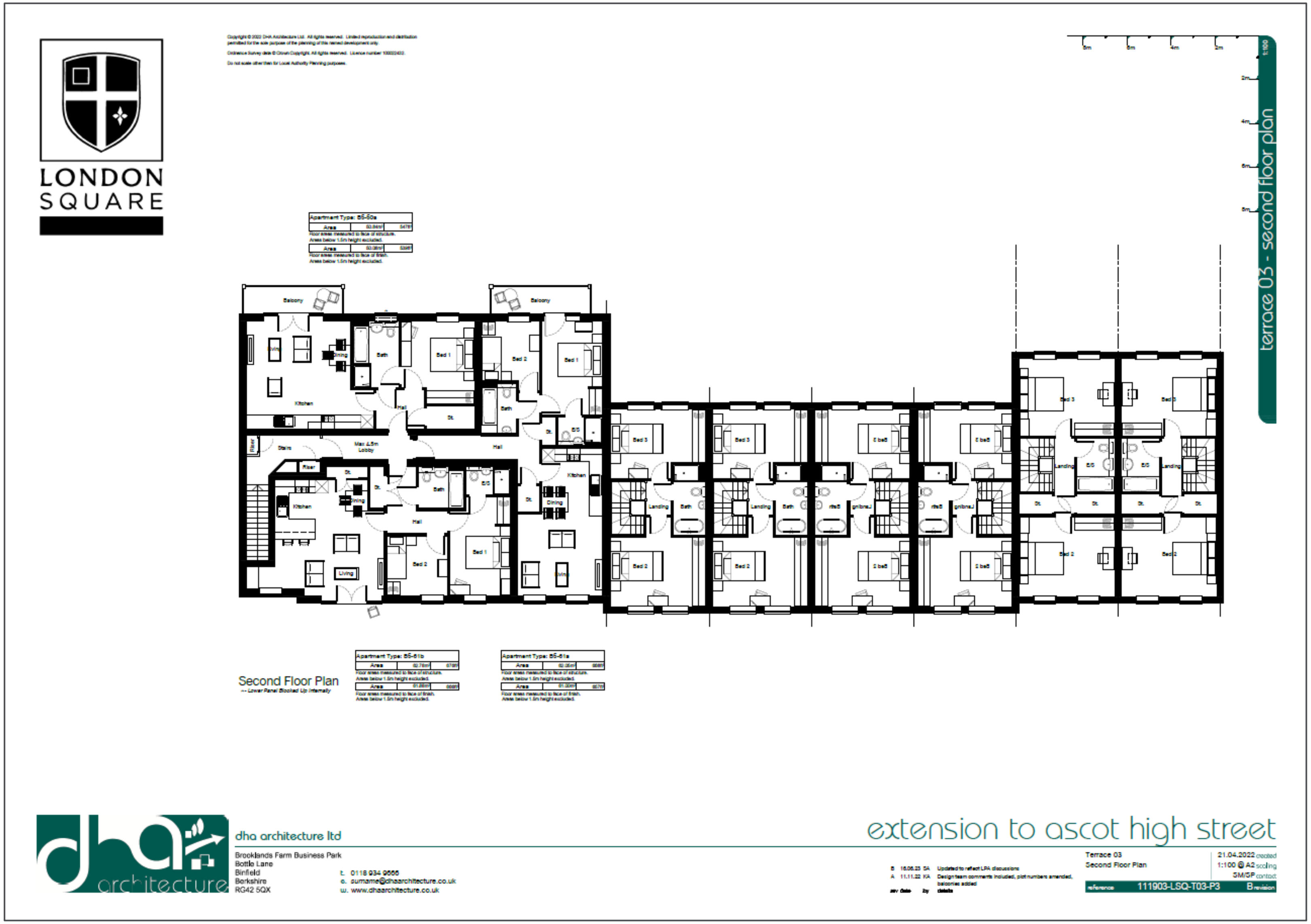
Terrace 03 – Ground Floor Plan



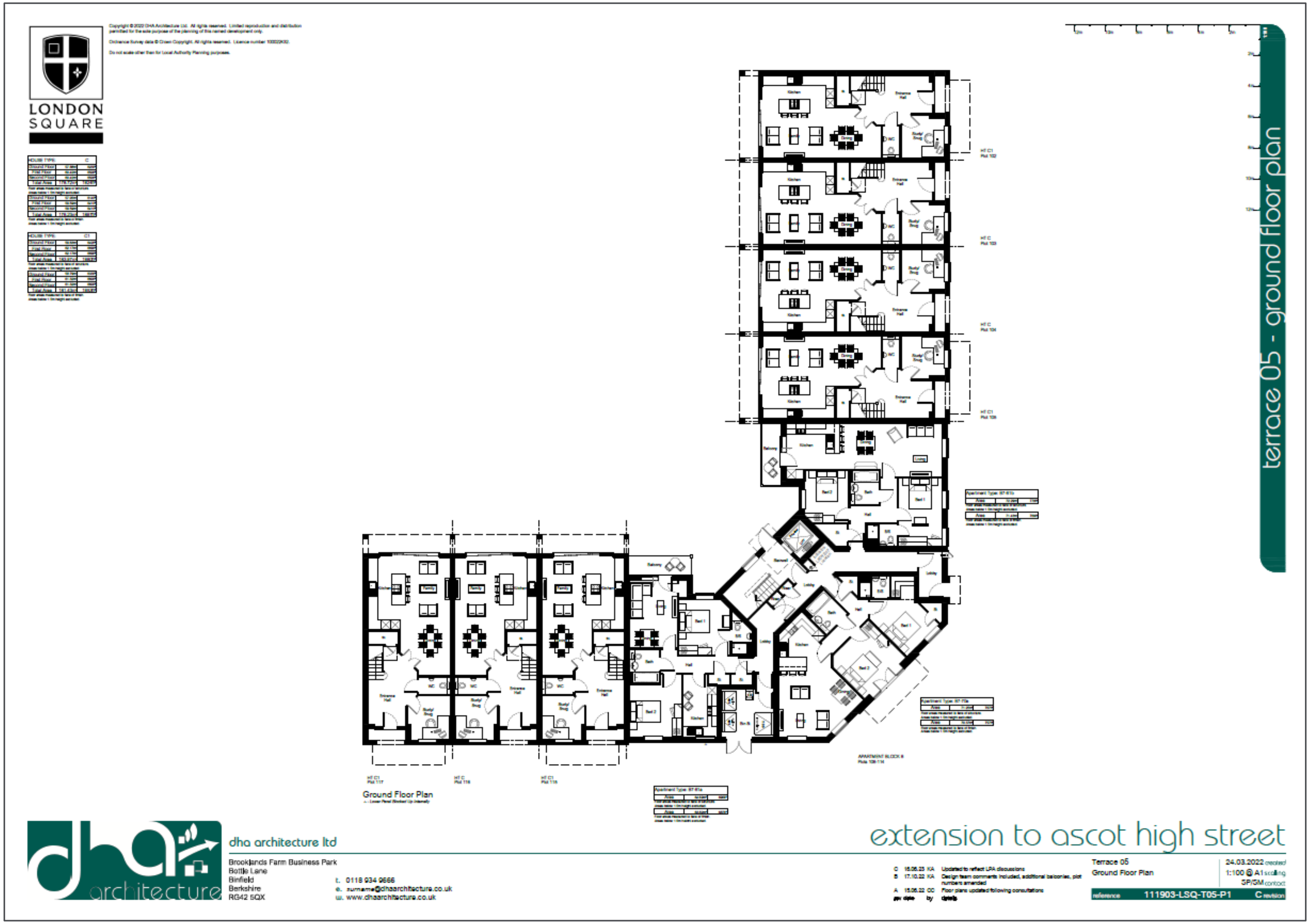
Terrace 03 – First Floor Plan



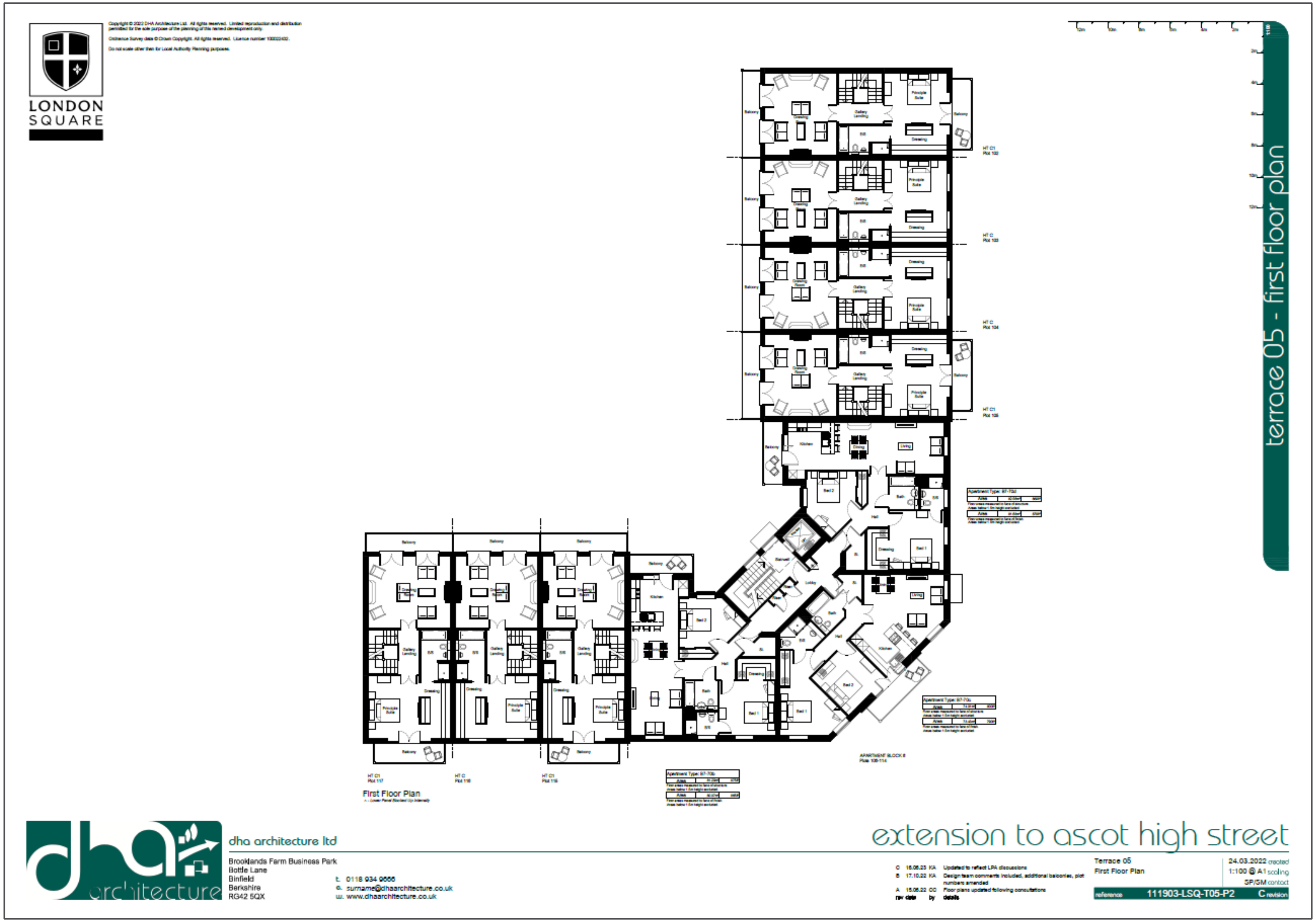
Terrace 03 – Second Floor Plan



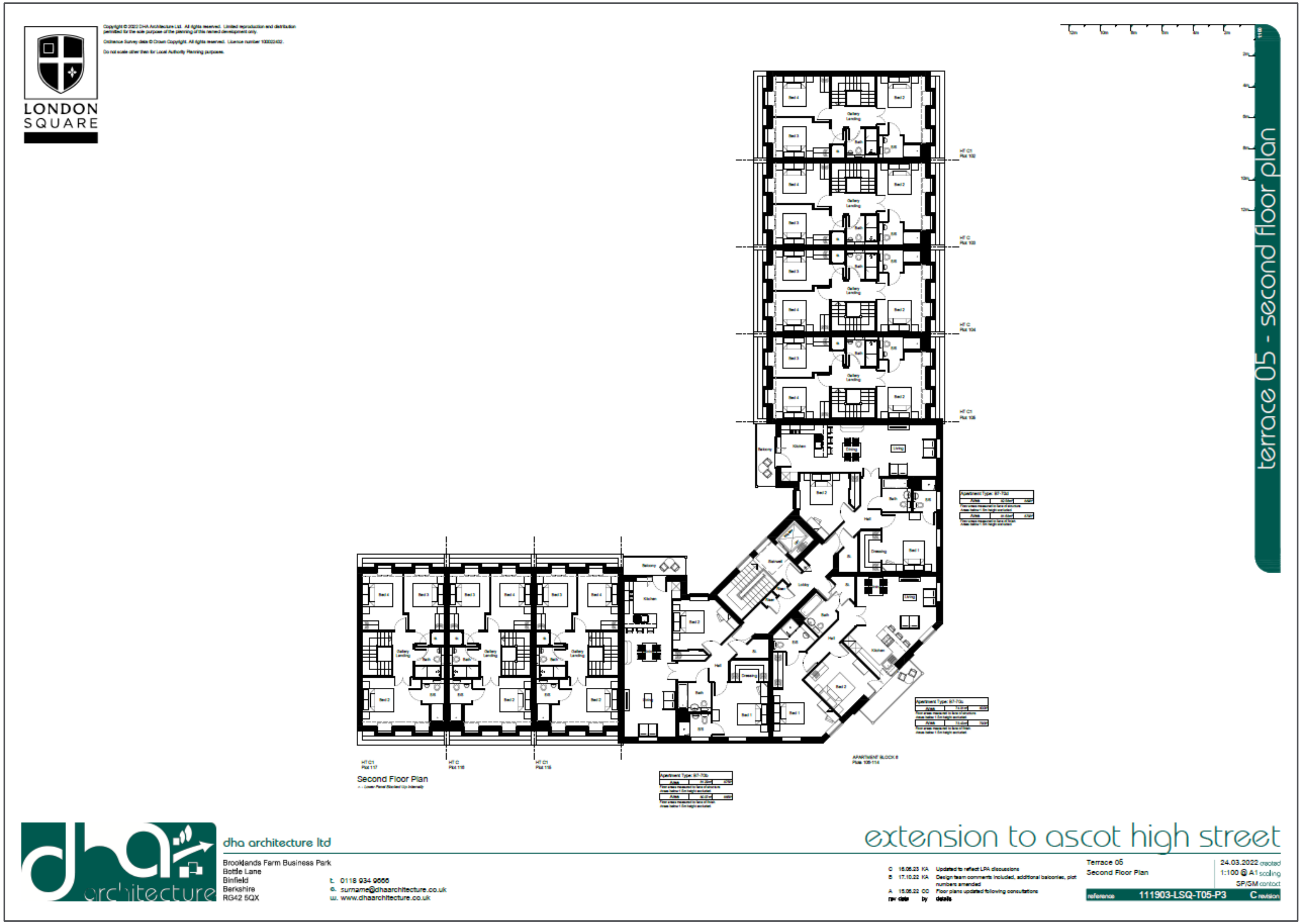
Terrace 05 – Ground Floor Plan



Terrace 05 – First Floor Plan



Terrace 05 – Second Floor Plan



Appendix B - Future Weather File – DSY1 2050

Results for future weather conditions using London Gatwick DSY1 2050 are presented in this section.

Results for the assessed occupied spaces under the future weather file with mixed-mode ventilation (openable windows and MVHR) are shown in **Error! Reference source not found.**.

Units	Space	Criterion 1 (% hours top-max>=1K)	Criterion 2 (hours operative temp. >26°C)	Pass / Fail
Block 1 – B1-70d (Second Floor)	Bedroom 1	4.6	75	Fail
	Bedroom 2	4.8	74	Fail
	Living/Kitchen/Dining	7.9	-	Fail
Block 1 – B1-61d (Third Floor)	Bedroom 1	3.2	57	Fail
	Bedroom 2	4.5	52	Fail
	Living/Kitchen/Dining	8.7	-	Fail
Block 2 – B2-70a (Third Floor)	Bedroom 1	3.6	58	Fail
	Bedroom 2	4.3	70	Fail
	Living/Kitchen/Dining	7.6	-	Fail
Block 3 – B3-70a (First Floor)	Bedroom 1	6	92	Fail
	Bedroom 2	4.3	72	Fail
	Living/Kitchen/Dining	6.4	-	Fail
Block 3 – B3-61a (Third Floor)	Bedroom 1	2.9	56	Fail
	Bedroom 2	4.1	47	Fail
	Living/Kitchen/Dining	6.8	-	Fail
T1 – HT A3 (Plot 59)	Bedroom 1	2.5	48	Fail
	Bedroom 2	5.2	64	Fail
	Bedroom 3	2.3	52	Fail
	Bedroom 4	4	94	Fail
	Living	7.5	-	Fail

Units	Space	Criterion 1 (% hours top-max>=1K)	Criterion 2 (hours operative temp. >26°C)	Pass / Fail
	Kitchen/Dining	5.1	-	Fail
T2 – HT B1 (Plot 67)	Bedroom 1	3.3	52	Fail
	Bedroom 2	3.5	70	Fail
	Bedroom 3	2.2	80	Fail
	Bedroom 4	3.4	75	Fail
	Living	5.3	-	Fail
	Kitchen/Dining/Family	4.9	-	Fail
	Snug	5.2	-	Fail
T3 – HT F (Plot 79)	Bedroom 1	2.2	39	Fail
	Bedroom 2	2.8	67	Fail
	Bedroom 3	2	41	Fail
	Living	6.2	-	Fail
	Kitchen/Dining/Family	4.8	-	Fail
	Reception Room	4.6	-	Fail
HT E - (Plot 85)	Bedroom 1	3	50	Fail
	Bedroom 2	2.6	82	Fail
	Bedroom 3	2.6	80	Fail
	Living	5	-	Fail
	Kitchen/Dining/Family	5.1	-	Fail
	Snug	5.2	-	Fail
T5 – HT C1 (Plot 117)	Principle Suite	2.2	17	Pass
	Bedroom 2	2.7	57	Fail
	Bedroom 3	2.3	83	Fail
	Bedroom 4	2.9	86	Fail

Units	Space	Criterion 1 (% hours top-max>=1K)	Criterion 2 (hours operative temp. >26°C)	Pass / Fail
	Drawing Room	4.2	-	Fail
	Kitchen/Dining/Family	4.2	-	Fail
	Study/ Snug	5.4	-	Fail

Table 9 - Simulation results summary for occupied spaces – using the DSY1 2050 future weather file

As demonstrated in the table above, only certain spaces meet the assessment criteria. This indicates that appropriate mitigation measures would be needed to be fitted to these spaces in order for comfortable thermal conditions to be achieved in the future. It should be noted that a pass under the future weather conditions is not compulsory. Some of the measures that can be taken in the future to mitigate overheating are installation of internal or external shutters and external shades.

Units	Space	Total Annual Results (% hours operative temp. >28oC)	Pass / Fail
Block 1 (Second Floor)	Communal Corridor	21.5	Fail
Block 2 (Third Floor)	Communal Corridor	21.5	Fail
Block 6 (Ground Floor)	Communal Corridor	1.8	Pass

Table 10 - Simulation results summary for communal corridors – using the DSY1 2050 future weather file

The simulation results using DSY1 2050 show that communal corridors in Block 1 (second floor) and Block 2 (third floor) does not pass the TM59 overheating criteria for corridors. The results are reported in Table 10. Although a pass in this criteria is not mandatory, measures such as improving insulation of communal pipe work and installing automated rooflights are to be considered in the future to reduce the risk of overheating in the communal corridors.

Appendix C - Window Openings

Units	Space	Glazing Area (m^2)	Equivalent Area [3](m^2)
Block 1 – B1-70d (Second Floor)	Bedroom 1	5.04	2.51
	Bedroom 2	4.61	2.29
	Living/Kitchen/Dining	7.55	3.24
Block 1 – B1-61d (Third Floor)	Bedroom 1	4.56	2.27
	Bedroom 2	2.41	0.797
	Living/Kitchen/Dining	6.42	3.41
Block 2 – B2-70a (Third Floor)	Bedroom 1	3.72	1.94
	Bedroom 2	2.80	1.38
	Living/Kitchen/Dining	7.56	3.85
Block 3 – B3-70a (First Floor)	Bedroom 1	4.92	1.62
	Bedroom 2	2.46	0.90
	Living/Kitchen/Dining	7.24	3.52
Block 3 – B3-61a (Third Floor)	Bedroom 1	5.02	2.50
	Bedroom 2	1.44	1.05
	Living/Kitchen/Dining	6.42	3.42
T1 – HT A3 (Plot 59)	Bedroom 1	3.00	1.20
	Bedroom 2	6.42	1.73
	Bedroom 3	3.00	1.20
	Bedroom 4	1.98	0.33
	Living	5.61	3.87

[3] Equivalent area (Aeq) is a measure of the aerodynamic performance of an opening. It is the area of a sharp-edged circular orifice through which air would pass at the same volume flow rate, under an identical applied pressure difference, as through the opening under consideration. This is the effective area divided by the orifice discharge coefficient (Cd0) which assumes a clear sharp-edged orifice would have a coefficient of discharge (Cd) of 0.62. or Aeff / Cd0 = Aeq)

Units	Space	Glazing Area (m^2)	Equivalent Area [3](m^2)
	Kitchen/Dining	9.78	8.70
T2 – HT B1 (Plot 67)	Bedroom 1	5.53	3.82
	Bedroom 2	6.42	1.97
	Bedroom 3	1.50	0.65
	Bedroom 4	1.50	0.61
	Living	4.47	3.42
	Kitchen/Dining/Family	9.83	8.72
	Snug	1.98	0.60
T3 – HT F (Plot 79)	Bedroom 1	2.54	1.01
	Bedroom 2	2.54	1.01
	Bedroom 3	2.54	1.01
	Living	3.90	2.11
	Kitchen/Dining/Family	7.08	7.08
	Reception Room	1.47	0.63
HT E - (Plot 85)	Bedroom 1	4.87	2.61
	Bedroom 2	1.12	0.51
	Bedroom 3	1.12	0.51
	Living	4.34	4.03
	Kitchen/Dining/Family	10.03	10.45
	Snug	1.419	0.715
T5 – HT C1 (Plot 117)	Principle Suite	3.56	3.76
	Bedroom 2	1.69	0.84
	Bedroom 3	0.84	0.42
	Bedroom 4	0.84	0.42
	Drawing Room	4.08	6.32

Units	Space	Glazing Area (m^2)	Equivalent Area [3](m^2)
	Kitchen/Dining/Family	5.27	8.17
	Study/ Snug	1.98	0.70

Table 11 – List of glazing and equivalent opening areas.

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