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technical note

Project	10 Pratt Mews, London, NW1 0AD.	**Project no**	PR11930
Note by	SAM & GS	**Date**	02-Dec-24
Subject	Thermal Comfort Assessment – TM52	**File Ref**	Reports

10 Pratt Mews, London, NW1 0AD – Thermal Comfort Analysis Rev 01 Update

Revision 01 of this report provides an update following receipt of comments received on the first issue of this report:

- *As part of the dynamic thermal modelling, the following measures from the cooling hierarchy are also considered to be feasible, and should be incorporated into the assessment*
  - *Local shading devices (internal blinds/shutters including shading for the new skylight), and*
  - *If after the above measure, rooms still overheat – MVHR with air tempering.*

- *The new second floor extension, with improved building fabric should be designed to not overheat. As stated in the overheating assessment, we understand that there are limitations as the extension needs to following the layout, façade design and facing of the existing buildings. However, with the TM52 results, the first and second floor offices are not as overheated as ground floor, with two criterion possibly reaching the passing grade with further cooling measures, as suggested above.*

Response

The thermal comfort analysis has been re-run (fourth run) incorporating the following:

- Internal blinds provided throughout, including to roof lights.
- G-value of new windows improved to 0.4
- Incorporating tempering of the air via a domestic style MVHR cooling module.

These results show that even with the inclusion of the local shading devises and tempering of the air that the requirements of TM52 are still not met, and that the spaces will therefore be deemed to be prone to overheating in Summer.

Recommendations & Comment

In order to not only avoid overheating, but also to actually provide a comfortable working environment, the installation of a comfort cooling (and heating) system is proposed, this cooling system being one that is reused and repurposed from the occupiers' previous offices.

Even if a ventilation with tempered air could be made to comply, with increased ventilation rates over and above the fresh air requirements, this would require a whole new system provided, one with ventilation ductwork that would need to be distributed and co-ordinated

throughout. There is no opportunity to repurpose any existing systems for this, so this would be new product which would have more embodied carbon associated over the re-use of the existing cooling system.

The proposed re-used cooling system will also provide the heating needs of the building, this utilising heat-pumps, a renewable energy technology. The building's existing heating system (radiators from a gas fired boiler) is currently disconnected, therefore, without the repurposed equipment some form of heating would need to be provided, this requiring the reconnection of the gas boiler, therefore increasing carbon emissions associated with its use.

Although consideration has been made to designing the new second floor not to overheat, and additional features have been incorporated, the fact is that due to noise and excessive odours at the rear of the property, cross ventilation cannot be achieved, and therefore natural ventilation is not sufficient to comply with the overheating criteria. This is borne out by the results provided for the third run, that even with the passive features and tempering of the air, the overheating criteria is still not met.

Thermal Comfort Assessment

This report is provided as a statement on the Thermal comfort condition and compliance with the cooling hierarchy for the proposed office development at 10 Pratt Mews, London, NW1 0AD, to accompany the planning application ref PP-13417695. The proposed development consisting of the refurbishment of an existing two storey office building and the provision of an additional floor of accommodation.

In accordance with London Plan requirements and considering the strategy to reduce the potential for internal overheating, the proposed development has been assessed under the CIBSE TM52 guidance and the London cooling hierarchy.

The proposed development has been modelled using Integrated Environmental Solutions Virtual Environment (IES-VE). IES-VE uses Dynamic Simulation Modelling to simulate the performance of the building at hourly intervals for a full year.

Reducing the Risk of Summertime Overheating / Minimisation of Cooling

The nature and location of the proposed development reduces the number of opportunities to minimise cooling demand via passive design measures with the building being located in a city centre location, where noise and air quality) limit the use of natural ventilation. In addition, the windows at the rear of the property have a requirement for them to be provided with obscured glazing and locked shut due to privacy requirements of the neighbouring properties and due to odours from adjacent restaurants.

In accordance with Policy SI 4 of the London Plan, the cooling hierarchy has been used to reduce the potential for overheating and the reliance on air conditioning systems as follows:

1) *Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure*

The majority of the building under consideration is an existing building, there is therefore no opportunity to reduce the cooling load due to orientation. Similarly, the new extension will need to following the layout, and therefore orientation of the lower floors.

The facade design for the extension has been progressed with full consideration given to solar gain, with appropriate glazing ratios and glass g-values provided for such commercial use. The third run of the overheating analysis goes further by including for internal blinds and a lower g-value of 0.4 provided to the new windows.

2) Minimise Internal Heat Generation through Energy Efficient Design

Due to the nature of the proposed distribution system for heating (refrigerant) there will be no heat gains associated with the distribution of heating through the development, such as might be the case were there an LTHW distribution system.

High efficacy LED lighting will be employed throughout, which emit less heat than other traditional lighting systems, these will utilise PIR and daylight sensing, dimming or switching off when not required, further reducing the heat gain to the space.

3) *Manage the Heat within the Building through Exposed Internal Thermal Mass and High Ceilings*

The extent to which thermal mass and high ceilings can be used to mitigate the majority of the building is limited due to this being an existing building. The ceiling height of the extension has however been maximised within the required height constraints.

4) Provide Passive Ventilation

The windows on the rear elevation are required to be fixed shut and provided with obscured glazing to protect the privacy of the neighbouring building and due to odours from the adjacent restaurant extract systems, this was anticipated to impact on the ability of natural ventilation alone to prevent overheating.

Overheating modelling, using TM52 methodologies, was undertaken to determine whether overheating could be mitigated against by the openings on the front elevation and at the rear of the new extension. Although the existing ground floor entrance glazing does not have any secure openings which could be used for natural ventilation, the baseline modelling did include for if high level natural ventilation was provided.

The use of natural ventilation was not sufficient to provide compliance with TM52.

5) Provide Mechanical Ventilation

Mechanical ventilation will be provided to meet the fresh air requirements of the occupants. The overheating study therefore next included the inclusion of this mechanical ventilation alongside the passive ventilation strategy. However, this was not sufficient to provide compliance with TM52.

An additional run of the model has been included in Rev 01 of this analysis, this includes the provision of internal shading (blinds) a lower g-value to new windows, and the provision of air tempering to the ventilation air, via a cooling module providing an 8°C reduction on the air supply temperature.

6) Provide Active Cooling Systems

As per the final stage of the cooling hierarchy, active cooling is therefore required in order to maintain a comfortable environment for the building occupants.

Overheating Modelling

Design Criteria

CIBSE TM52 - The limits of thermal comfort: avoiding overheating in European buildings has been used as a guide for what is regarded as acceptable thermal conditions.

A room or building that fails any two of the three criteria is classed as overheating.

The CIBSE TM54 design criteria consist of the following three key elements:

- Criterion 1: Hours of exceedance (He) ΔT (Deg K) = Top T max where T max is the maximum acceptable temperature ΔT must not be greater or equal to 1 Deg K From May-Sept for more than 3% of occupied hours.

- Criterion 2: Daily weighted exceedance (We) a weighted measure of by how much and how long Δ T is exceeded in a day We must not exceed 6.

- Criterion 3 -Upper limit temperature (Tupp) ΔT must not exceed 4 Deg(K)

Modelling and Design Specifications

Geometry

The model has been constructed based on the architectural drawings provided. All the spaces were modelled along with their orientation. All the non-domestic habitable areas at the office building were tested under the TM52 overheating criteria.

Location & Weather

The development is located in north London. Therefore, the CIBSE London Heathrow DSY1. file has been applied, to accurately reflect the performance of the building.

Building Specification

The simulation process takes into account the heat flow through the fabric, based on the fabric's thermal properties. Table 1 contains a summary of the construction U-values used for the overheating criteria calculations.

Table 1: Building Fabric	
Reference	**Design Criteria**
Existing External Walls	1.70
New Wall	0.26
Ground floor	0.58
Existing Roof (Flat roof)	1.40
New Roof (Flat roof)	0.18
Windows	1.60
Roof Light	1.40

Internal Gains

Building occupancies, room heating set points, illumination levels and use of appliances have been modelled according to the National Calculation Method (NCM) as defined by the Communities and Local Government.

Ventilation Strategies

For the natural ventilation strategy, the design incorporates fixed windows, while the openable windows are designed as sash windows, allowing for controlled airflow.

For the mechanical ventilation strategy, each habitable space undergoes testing with a mechanical ventilation system, which operates at a flow rate of 10 l/s, in addition to the natural ventilation approach.

Finally, a thorough assessment is conducted for all habitable areas, evaluating their performance with a comfort cooling system to ensure optimal thermal comfort conditions.

Modelled Results

Tables 2, 3, 4 and 5 below show that the TM52 analysis considers passive strategies, mechanical ventilation, mechanical ventilation with air tempering and comfort cooling scenarios to meet the requirements stated in the TM52 document.

Table 2: TM52 results (Natural ventilation strategy)					
Room Reference	**Criterion 1**	**Criterion 2**	**Criterion 3**	**Criteria Failing**	**TM52 Requirement**
GF-Reception	26.3	72	11	1 & 2 & 3	Non-compliance
GF-Office	65.1	87	9	1 & 2 & 3	Non-compliance
GF-Kitchen	36	75	9	1 & 2 & 3	Non-compliance
FF-Office	5	31	5	1 & 2 & 3	Non-compliance
SF-Office	6	34	5	1 & 2 & 3	Non-compliance

Table 3: TM52 results (Mechanical ventilation strategy)					
Room Reference	**Criterion 1**	**Criterion 2**	**Criterion 3**	**Criteria Failing**	**TM52 Requirement**
GF-Reception	24.8	67	11	1 & 2 & 3	Non-compliance
GF-Office	54.5	78	8	1 & 2 & 3	Non-compliance
GF-Kitchen	34.6	74	9	1 & 2 & 3	Non-compliance
FF-Office	4.8	31	5	1 & 2 & 3	Non-compliance
SF-Office	5.7	34	5	1 & 2 & 3	Non-compliance

Table 4: TM52 results (Mechanical ventilation strategy with air tempering)					
Room Reference	**Criterion 1**	**Criterion 2**	**Criterion 3**	**Criteria Failing**	**TM52 Requirement**
GF-Reception	22.9	63	11	1 & 2 & 3	Non-compliance
GF-Office	43.2	72	8	1 & 2 & 3	Non-compliance
GF-Kitchen	33.4	72	9	1 & 2 & 3	Non-compliance
FF-Office	4.7	30	5	1 & 2 & 3	Non-compliance
SF-Office	4.6	25	4	1 & 2 & 3	Non-compliance

Table 5: TM52 results (Comfort Cooling strategy)					
Room Reference	**Criterion 1**	**Criterion 2**	**Criterion 3**	**Criteria Failing**	**TM52 Requirement**
GF-Reception	0	0	0	-	Complies
GF-Office	0	0	0	-	Complies
GF-Kitchen	0	0	0	-	Complies
FF-Office	0	0	0	-	Complies
SF-Office	0	0	0	-	Complies

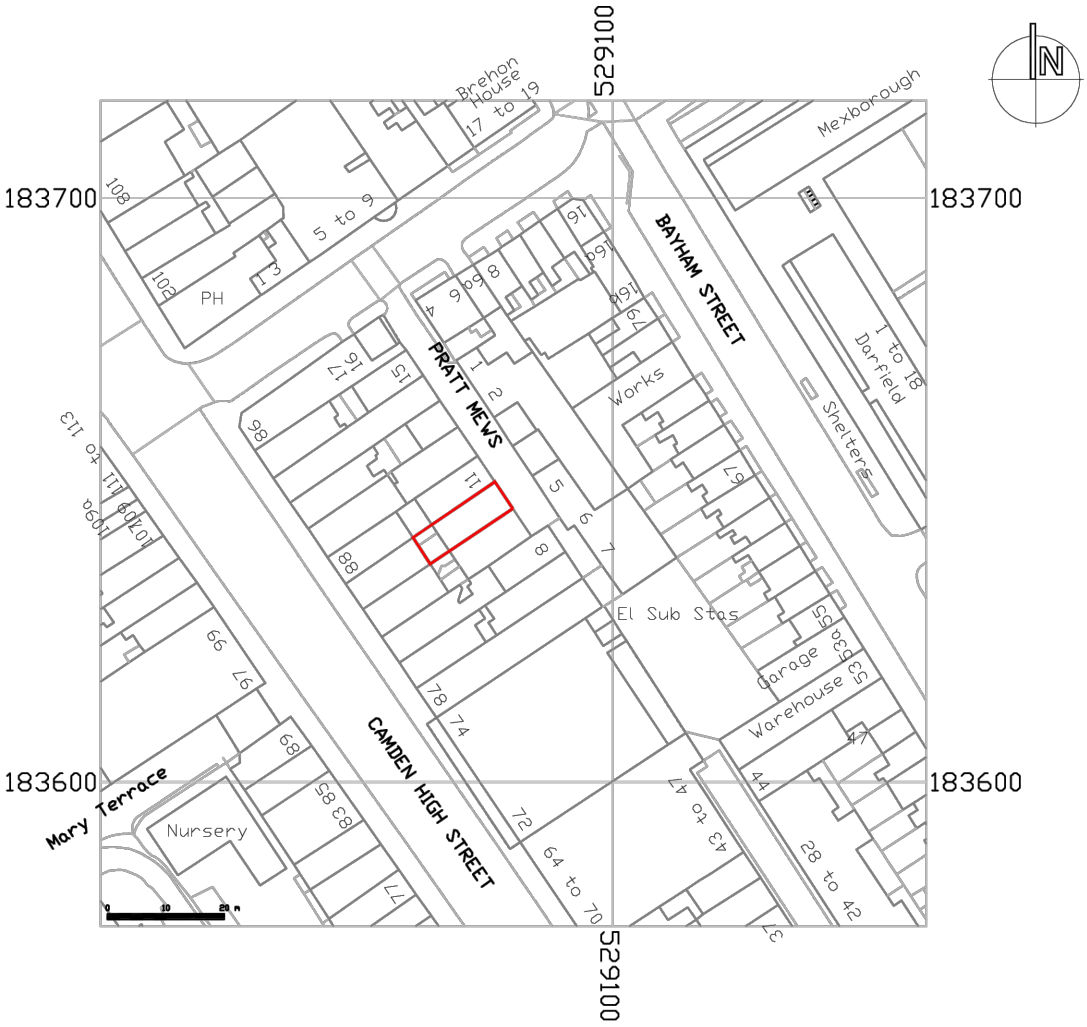
Conclusion

The development at 10 Pratt Mews, London, NW1 0AD, was modelled using IES-VE and the specifications provided, to determine whether overheating could be mitigated against, and compliance with TM52 shown, by the use of passive ventilation means (natural ventilation), mechanical ventilation, mechanical ventilation with tempered air or whether mechanical cooling would be required.

The results show that natural ventilation alone, or with additional mechanical ventilation and air tempering, was not sufficient to mitigate against overheating, and that therefore comfort cooling would be required in order to maintain a comfortable working environment and to meet the requirements of TM52. It is therefore proposed that a cooling system will be

provided, this being a reused and repurposed system from the occupiers previous offices. This system will also provide the heating requirements of the building, which uses heat pumps a renewable energy technology.

Appendix A – Associated Drawings



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	Location Plan		
	1: 1250 @ A4	Sep 2024 KB	2403_Loc_P

Revision	Date		Notes
-	20.09.2024	KB	Planning Application

PLANNING

Drawing Status:
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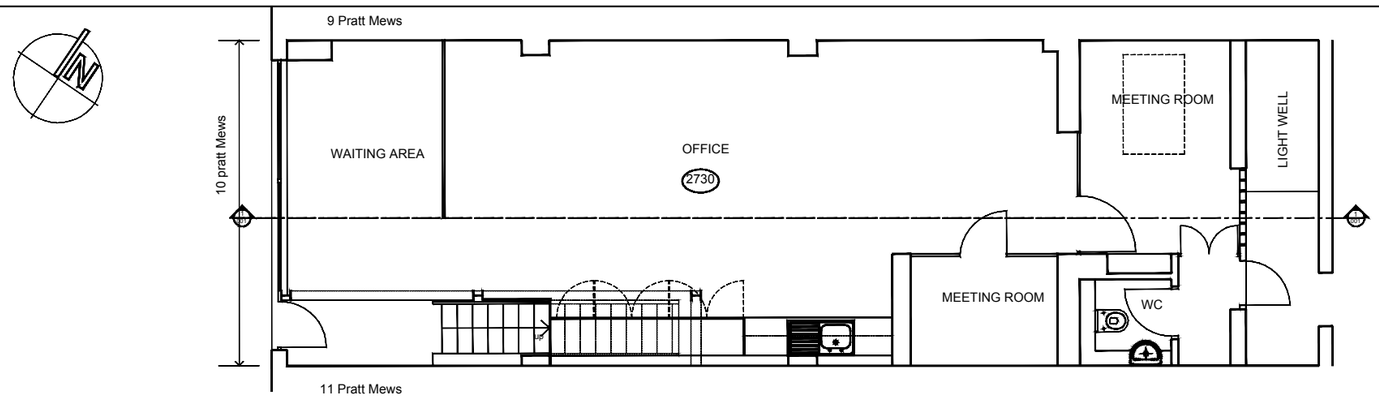
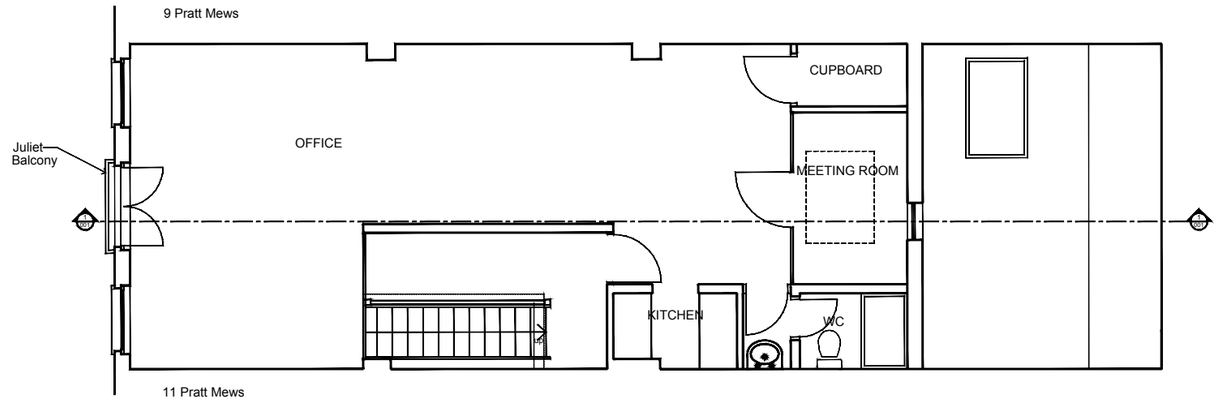
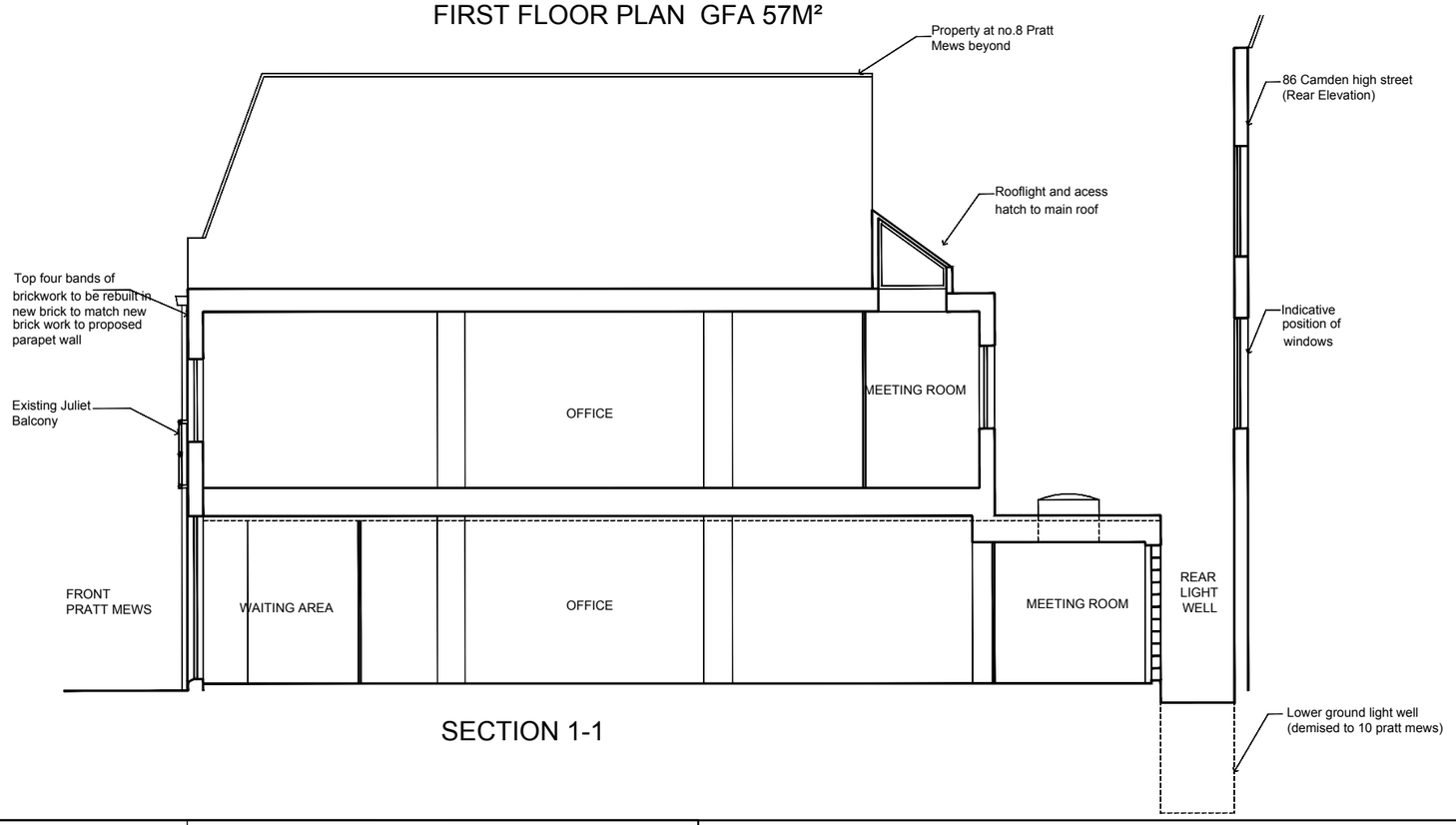


GROUND FLOOR PLAN GFA 75.7M²



FIRST FLOOR PLAN GFA 57M²



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Existing plans and section through

1: 100 @ A3 | **Sep 2024** | **KB** | **2403_P_EX_P_S_01**

Revision	Date		Notes
-	20.09.2024	KB	Planning Application

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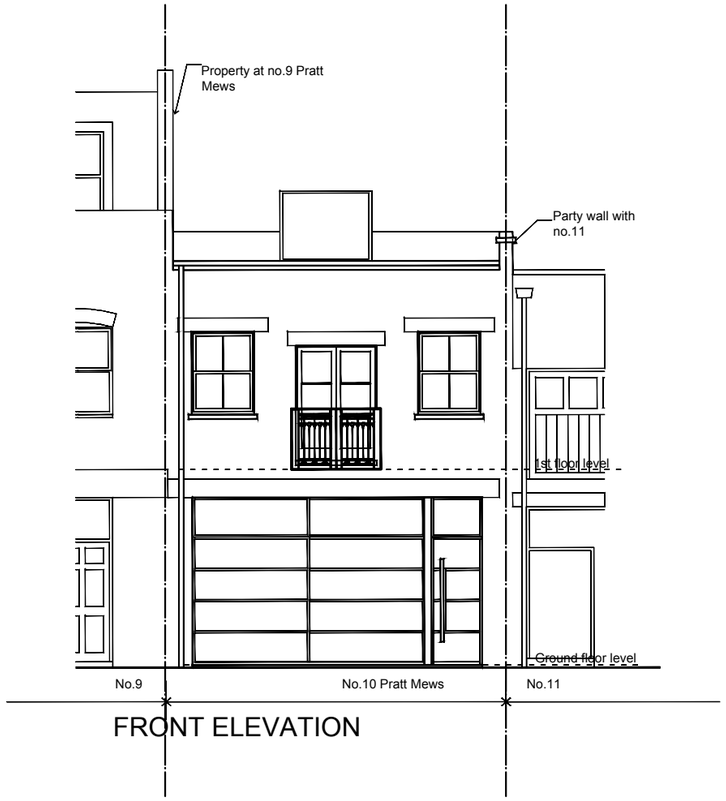
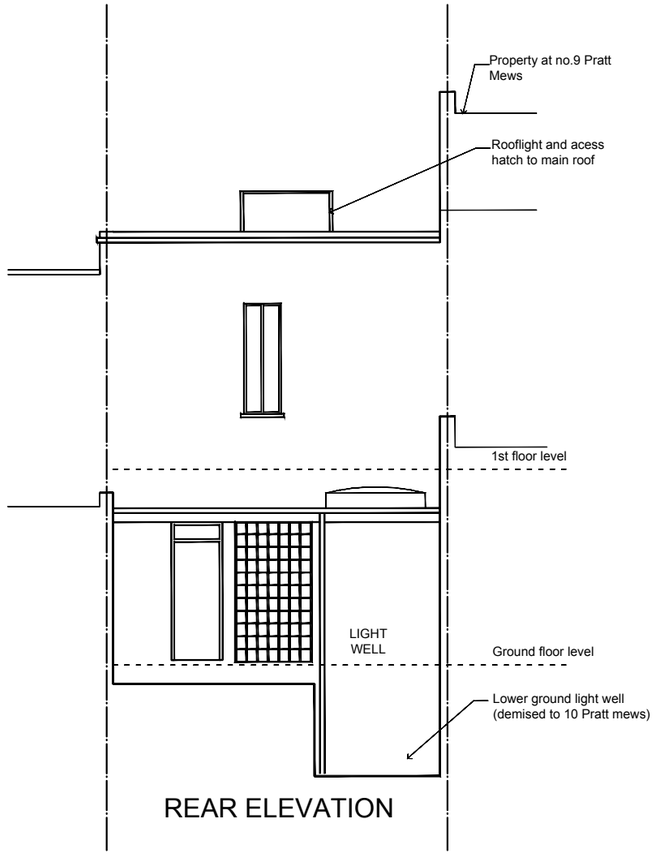


FRONT ELEVATION



REAR ELEVATION

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Existing front and rear elevations

1: 100 @ A3 | **Sep 2024** | **KB** | **2403_P_EX_EL_01**

Revision	Date		Notes
-	20.09.2024	KB	Planning Application

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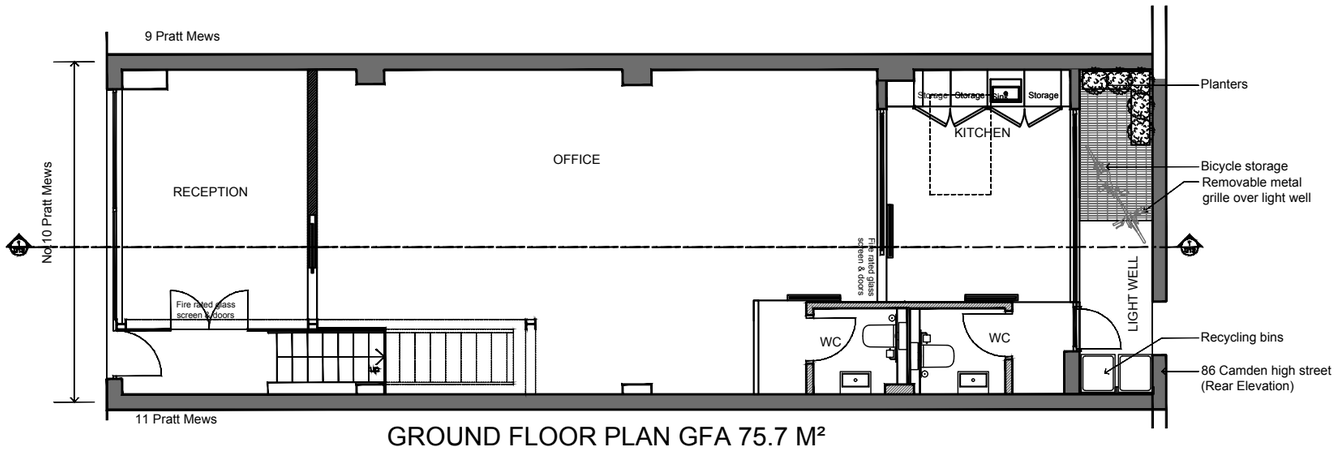
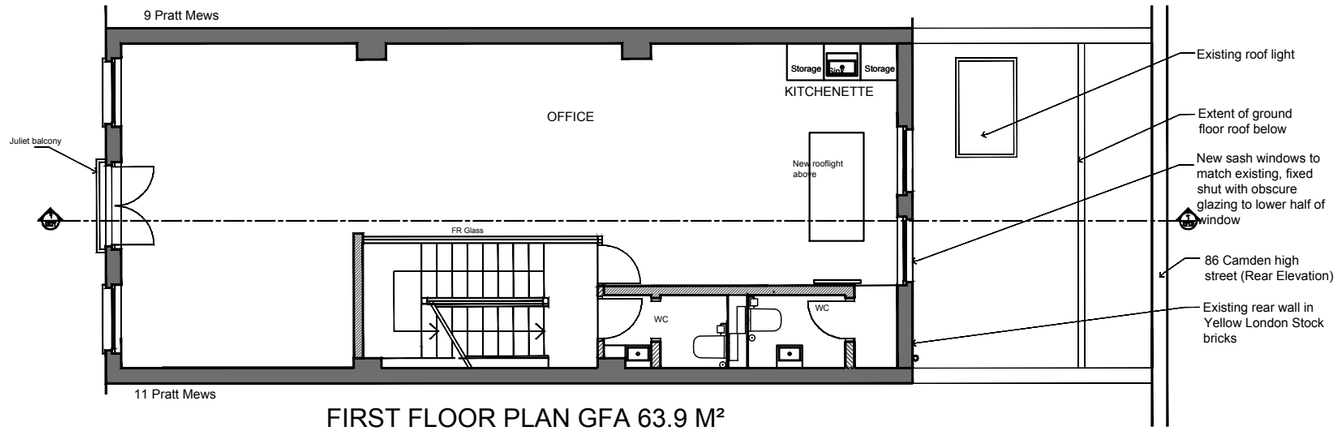
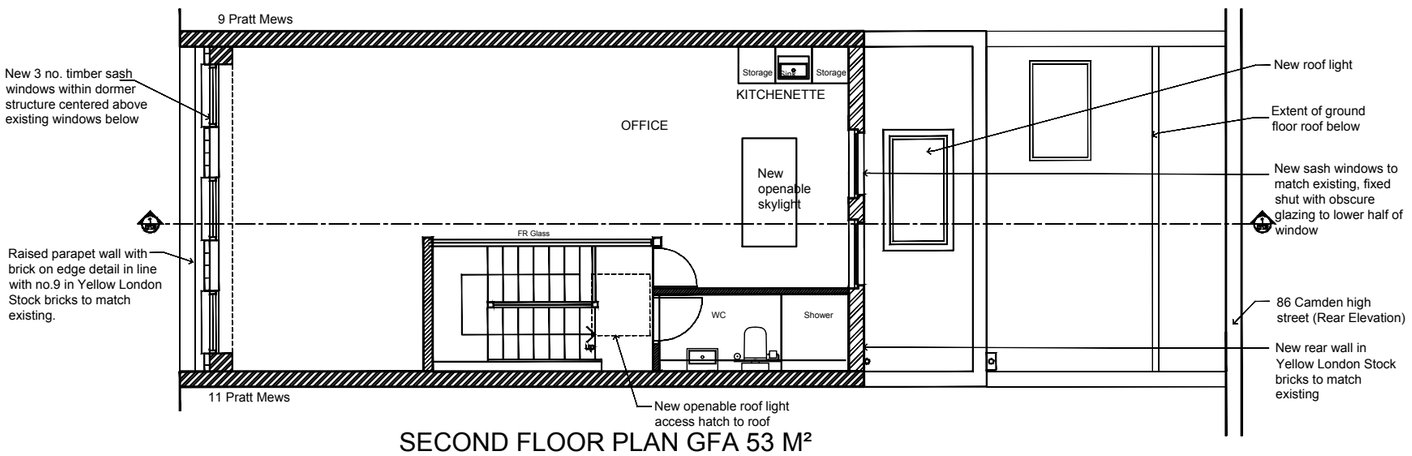


GROUND FLOOR PLAN GFA 75.7 M²



FIRST FLOOR PLAN GFA 63.9 M²



SECOND FLOOR PLAN GFA 53 M²

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Proposed ground, first and second floor plans

1: 100 @ A3 | **Sep 2024** | **KB** | **2403_P_Pr_P_01**

Revision	Date		Notes
-	20.09.2024	KB	Planning Application

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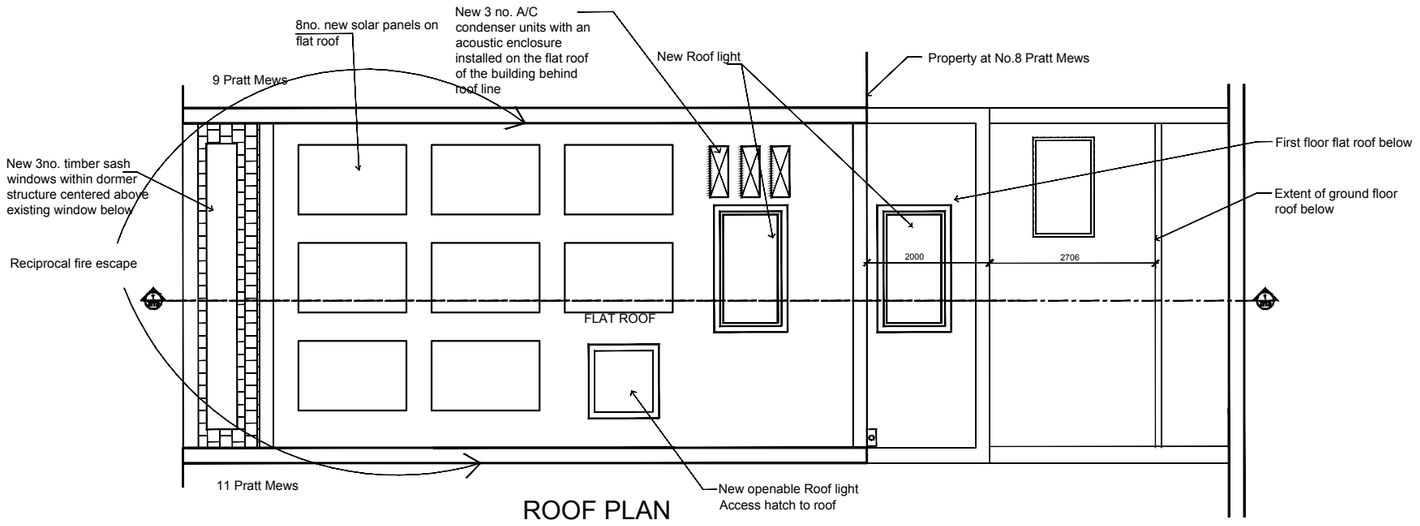
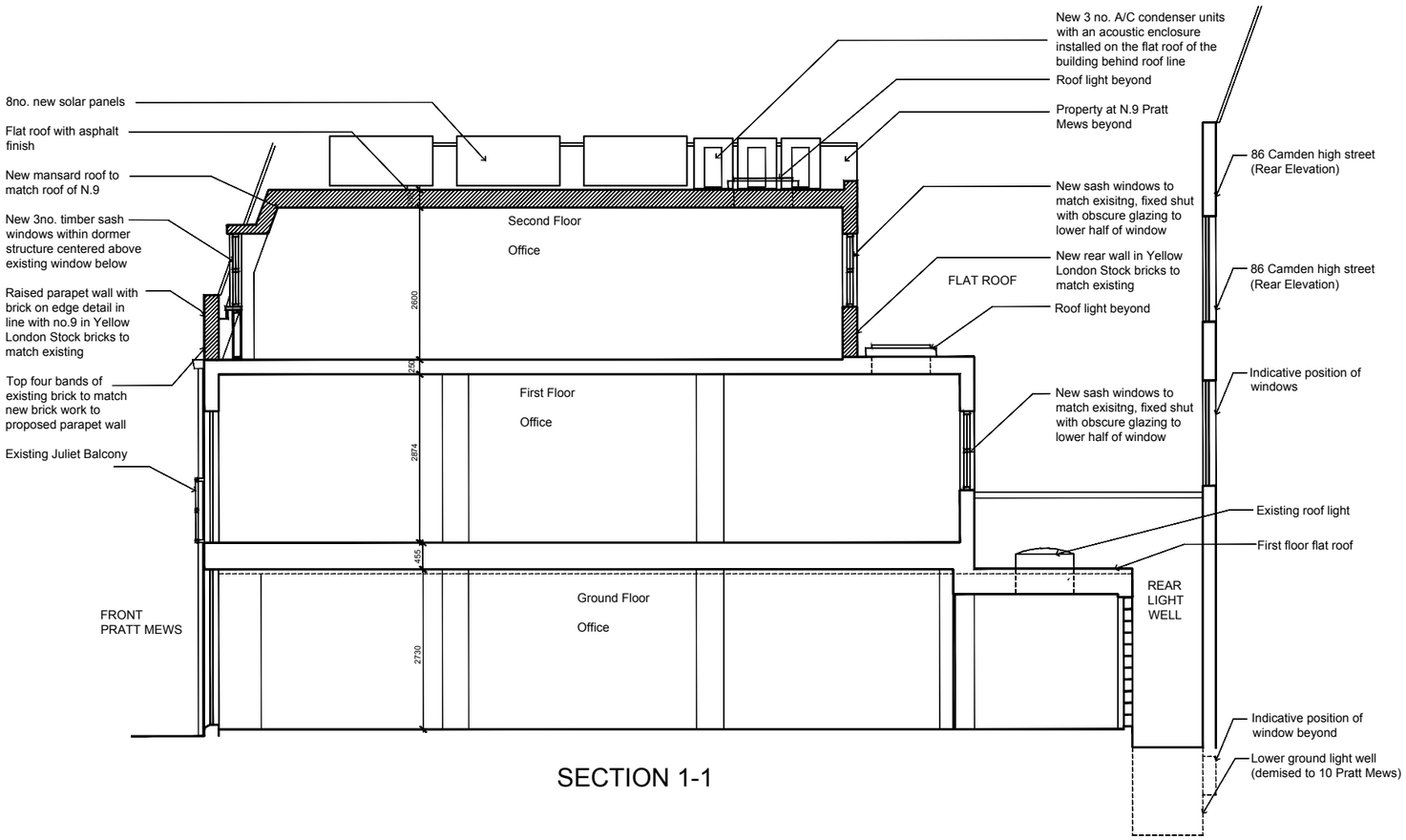


ROOF PLAN



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Proposed roof plan and section through

1: 100 @ A3 | **Sep 2024** | **KB** | **2402_P_Pr_S_01**

Revision	Date		Notes
-	20.09.2024	KB	Planning Application

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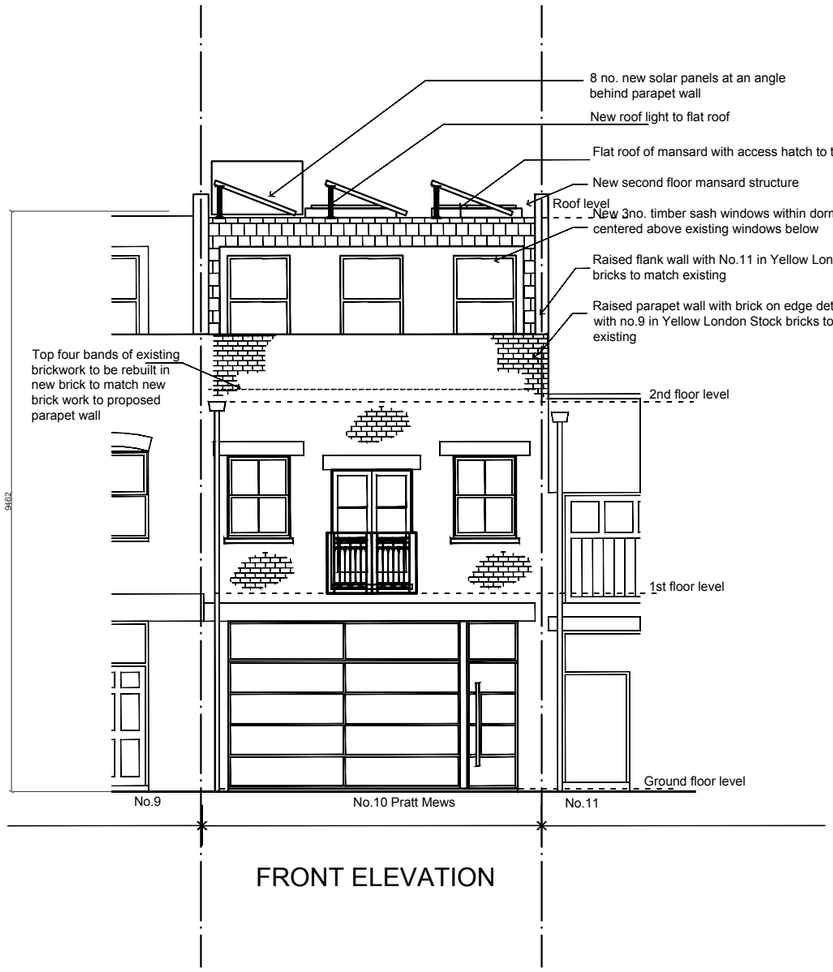
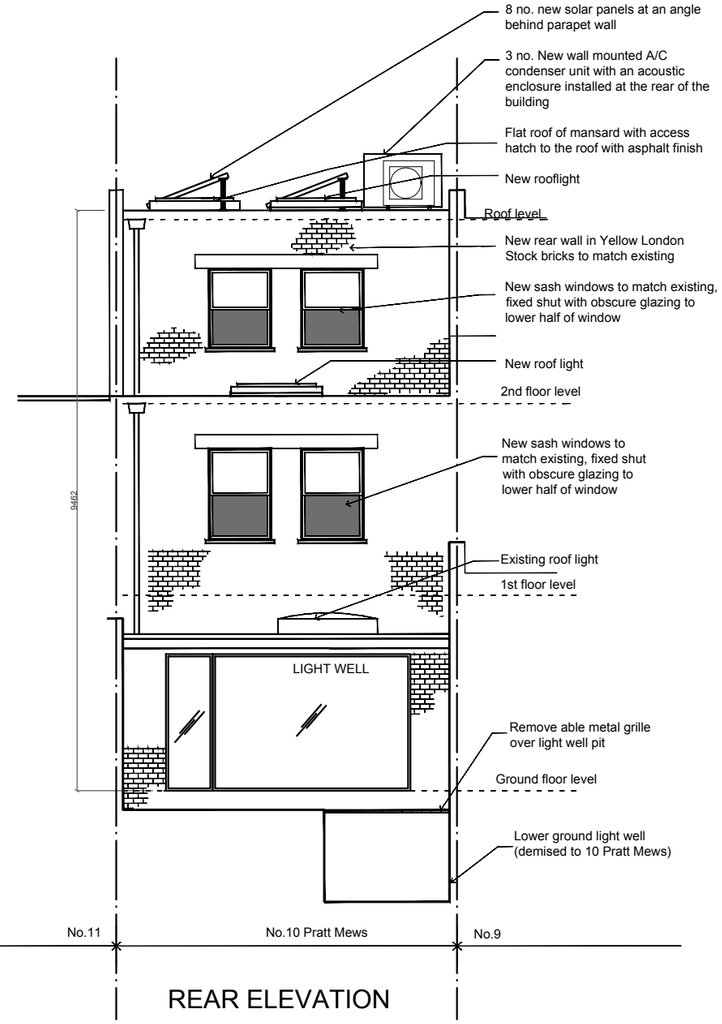


FRONT ELEVATION



REAR ELEVATION

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Proposed Front and Rear Elevation

1: 100 @ A3 | Sep 2024 | KB | 2402_P_Pr_EL_01

Revision	Date		Notes
-	20.09.2024	KB	Planning Application

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1 m 2 m 5 m

SCALE 1: 100 @ A3