

TECHNICAL NOTE ON VENTILATION STRATEGY

330 Gray's Inn Road

Produced by XCO₂ for Groveworld

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1.0 EXECUTIVE SUMMARY

This report has been produced for the redevelopment of 330 Gray's Inn Road in the London Borough of Camden. This report will demonstrate the proposed development's compliance with Building Regulations Part F, which sets out the minimum requirements to ventilate buildings adequately. Smoke control ventilation has also been considered in this report in line with Part B of the Building Regulations. The final smoke control strategy will require confirmation from Building Control and input from a fire specialist.

The scope of the report is to outline a ventilation strategy for the commercial spaces and residential apartments, and discuss associated ventilation intake and exhaust locations.

The commercial areas (hotel, offices and gym) have been proposed to be mechanically ventilated by multiple air handling units (AHU) located in the basement levels. Fresh air intakes will be at the upper ground floor level towards Wicklow Street (for the hotel) and roof level (for the offices and gym) in order to minimise ingress of air pollutants from the main roads (Gray's Inn Road and Swinton Street). Exhaust air discharge will terminate at the same levels suitably distanced from the fresh air intakes.

The commercial kitchen serving the hotel's restaurant it has been proposed to be provided with a commercial kitchen extract system and a supply air handling unit (AHU) to provide fresh air to the restaurant seating area and make-up air to the kitchen. The ventilation units are proposed to be located in the basement. Fresh air intake will be at the upper ground floor level towards Wicklow Street in order to minimise ingress of air pollutants from the main roads. Exhaust air discharge will be at ground floor high-level suitably distanced from the fresh air intake.

Each apartment is proposed to have a local mechanical ventilation with heat recovery unit (MVHR) with fresh air and exhaust terminations on the external façade. NO_x and PM_{2.5} shall be provided in line with the Air Quality Consultant requirements.

The ventilation strategy described within this report is to be designed in accordance with the available information at RIBA Stage 3 design. As the overall building design progresses the design intent highlighted in this ventilation strategy must be maintained otherwise an amendment to the planning application maybe required.

2.0 INTRODUCTION

2.1 SITE

The Royal National Throat, Nose and Ear Hospital previously occupied the premises at 330 Gray's Inn Road. The proposed development consists of the demolition of most of the existing buildings on site to build a new hotel, office spaces, a gym and private and affordable residential units.

The latest accommodation schedule prepared by the architect indicates the following areas and number of units proposed:

- Hotel with Restaurant: 8623 m² GIA, 182 guestrooms
- Office: 12106 m² GIA
- Gym: 1335 m² GIA
- Residential Block A: 3409 m² GIA, 32 apartments
- Residential Block B: 4094 m² GIA, 44 apartments.

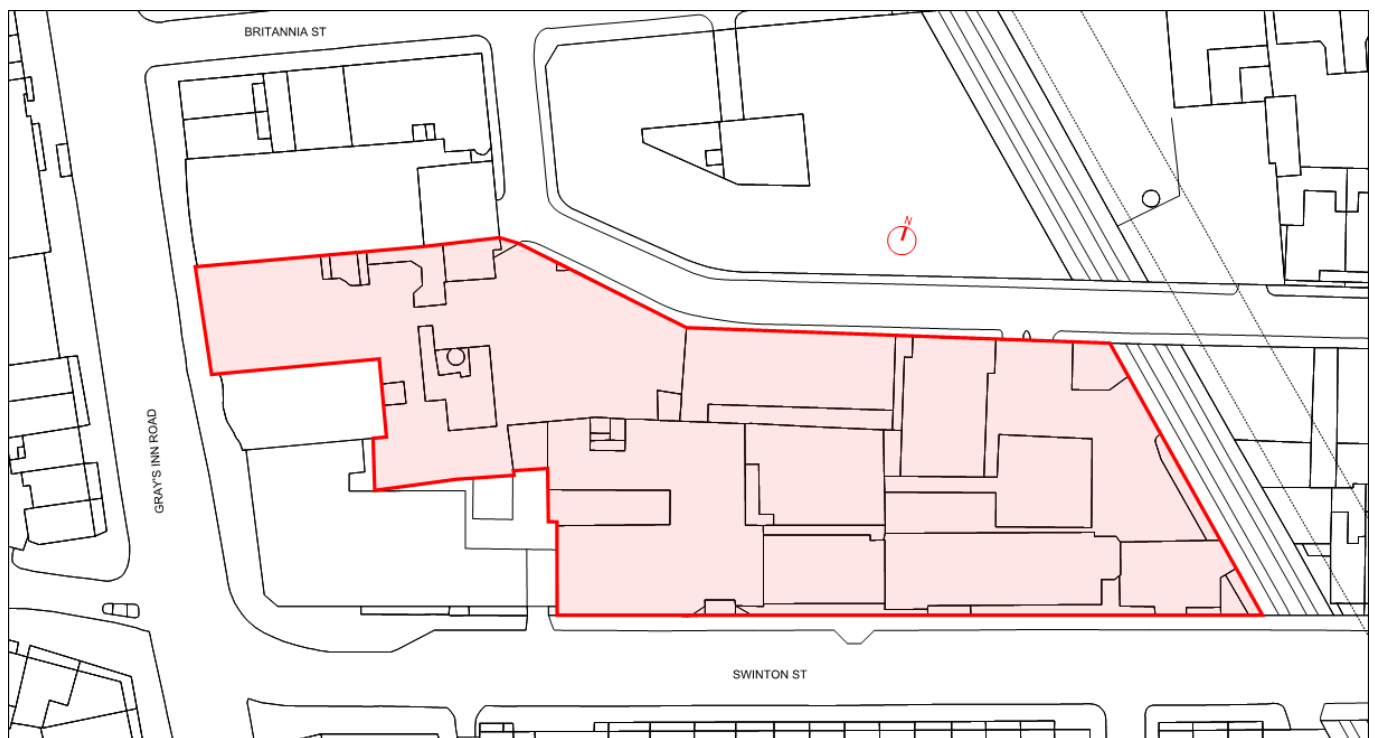


Figure 1: Location Plan

2.2 SCOPE

The scope of this report is to provide a ventilation statement for planning. By utilising the Building Regulations, this report will outline the ventilation strategy for the proposed development. The proposed development's ventilation system design will meet the requirements set out within Part F and Part B of the Building Regulations. Smoke control requirements will need final confirmation from Building Control and the Fire Consultant.

3.0 PERFORMANCE STANDARDS

3.1 BUILDING REGULATION APPROVED DOCUMENT PART F –2010 WITH 2013 AMENDMENTS

Approved Document Part F of 'The Building Regulations' (2010 edition incorporating 2010 and 2013 amendments) states that 'ventilation systems in buildings result in energy being used to heat fresh air taken in from outside and, in mechanical ventilation systems, to move air into, out of and/or around the building'. The mechanical services design has been developed in accordance with this document.

Building Regulations Part F sets out the minimum requirements to ventilate buildings adequately. These regulations will be followed throughout the services design for the project. These regulations have been seen by some to be in conflict with the general requirement to reduce energy; as increasing ventilation rates for fresh air purposes can lead to increased energy to heat or cool incoming air for comfort requirements. However, with modern servicing strategies that incorporate high efficiency heat recovery equipment, the potential conflict between these two requirements can be reduced. Wherever a significant volume of used air is being exhausted to atmosphere, the use of heat recovery will be considered to recover heat energy from outgoing air streams for transfer into incoming fresh air supplies, thereby saving significant primary energy demands for buildings.



3.2 VENTILATION RATES FOR RESIDENTIAL UNITS

The ventilation in each apartment will be designed in accordance with System 4 – Continuous mechanical supply and extract with heat recovery (MVHR), as outlined in Approved Document Part F of the building regulations. The following tables are extracted from the document and state the minimum performance requirements for continuous ventilation systems for dwellings.

The specific fan power for all mechanical ventilation equipment shall be in compliance with the Building Regulations Domestic Ventilation Compliance Guide. Communal plant room ventilation shall be in compliance with BS6644.

Table 1: Mechanical Extract Ventilation Rates

Room	Continuous extract	Minimum low rate
Kitchen	13 l/s	Total extract rate should be at least the whole dwelling ventilation rate given in Table 2.
Utility room	8l/s	
Bathroom	8l/s	
Sanitary accommodation	6l/s	

Table 2: Whole dwelling ventilation rates

	Number of bedrooms in dwelling				
	1	2	3	4	5
Whole dwelling ventilation rate ^{a,b} (l/s)	13	17	21	25	29

Notes:

- In addition, the minimum ventilation rate should be not less than 0.3 l/s per m² of internal floor area.
- This is based on two occupants in the main bedroom and a single occupant in all other bedrooms. This should be used as the default value. If greater level of occupancy is expected add 4 l/s per occupant.

3.3 VENTILATION RATES FOR COMMERCIAL UNIT

The tables below outline the minimum performance requirements for ventilation systems for buildings other than dwellings and are extracted from Approved Document Part F of the building regulations.

The specific fan power for all mechanical ventilation equipment shall be in compliance with the Building Regulations Non-Domestic Building Services Compliance Guide.

Table 3: Ventilation rates for new building other than dwellings

Extract Ventilation Rates	
Room	Extract rate
Food and beverage preparation areas (not commercial kitchens)	Intermittent air extract rate of: 15 l/s with microwave and beverages only 30 l/s adjacent to the hob with cooker(s) 60 l/s elsewhere with cooker(s) All to operate while food and beverage preparation is in progress
Rooms containing printers and photocopiers in substantial use (greater than 30 minutes per hour)	Air extract rate of 20 l/s per machine during use. Note that, if the operators are in the room continuously, use the greater of the extract and whole building ventilation rates
Office sanitary accommodation and washrooms	Intermittent air extract rate of: 15 l/s per shower / bath 6 l/s per WC/ urinal
Commercial kitchens	In line with BESA DW172 (2018)

Whole building ventilation rate for air supply to offices	
	Air supply rate
Total outdoor air supply rate for offices (no smoking and no significant pollutant sources)	10 l/s per person

Whole building ventilation rate of other buildings and spaces	
Building / Space / Activity	Regulations and guidance
High-rise (non-domestic buildings)	CIBSE Guide B:2005, Section 2.3.12 and CIBSE AM10: 2000 if naturally ventilated and CIBSE AM13:2000 if mixed-mode ventilation

3.4 PART B: FIRE SAFETY – BUILDINGS OTHER THAN DWELLINGHOUSES

Part B of Building Regulations outlines the following key smoke ventilation requirements in Section 2, Means of Escape from Flats:

“Smoke control of common escape routes by natural smoke ventilation:

2.26 In buildings, other than those complying with the requirements of a small single stair building, the corridor or lobby adjoining the stair should be provided with a vent. The vent from the corridor/lobby should be located as high as practicable and such that the top edge is at least as high as the top of the door to the stair.

There should also be a vent, with a free area of at least 1m², from the top storey of the stairway to the outside.

In single stair buildings the smoke vents on the fire floor at the head of the of the stair should be actuated by means of smoke detectors in the common access space providing access to the flats.

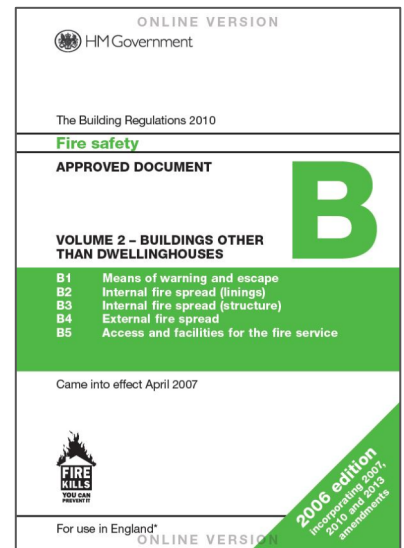
Vents should either:

- a. be located on the external wall with minimum free area of 1.5m²; or*
- b. discharge into a vertical smoke shaft (enclosed at the base) meeting the following criteria:*
 - i. Minimum cross-sectional area 1.5m² (minimum dimension 0.85m in any direction), opening at roof level at least 0.5m above any surrounding structures within a horizontal distance of 2.0m. The shaft should extend at least 2.5m above the ceiling of the highest storey served by the shaft;*
 - ii. The minimum free area of the vent from the corridor/lobby into the shaft and at the opening at the head of the shaft and at all internal locations with the shaft (e.g. safety grilles) should at least be 1.0m²; ...”*

“Smoke control of common escape routes by mechanical ventilation:

2.27 As an alternative to the natural ventilation provisions in paragraph 2.26, mechanical ventilation to the stair and/or corridor/lobby may be provided to protect the stair(s) from smoke. Guidance on the design of smoke control systems using pressure differentials is available in BS EN 12101-6:2005.”

This is all subject to confirmation from Building Control and input from a fire specialist.



4.0 VENTILATION STRATEGY

The ventilation strategy for the residential and commercial areas of the proposed development will seek to follow the recommendations as found within Approved Document Part F of the Building Regulations and DW172.

4.1 COMMERCIAL UNITS

The commercial spaces (hotel, offices and gym) will be served by multiple air handling units (AHU) located in the basement plant rooms. The AHU will contain a heat exchanger (thermal wheel or plate) that can recover heat (or cooling in the summer) from the outgoing airstream with very low levels of carryover leakage with the incoming fresh airstream. This will allow a single unit to be used to ventilate all areas of the commercial space, including bathrooms and kitchenettes, without polluting the fresh air supply. The thermal efficiency of the heat exchanger and specific fan power for the AHU shall be in compliance with the Building Regulations Non-Domestic Building Services Compliance Guide.



Figure 2: Air Handling Unit

The total outdoor air supply rate for commercial spaces should be at least:

- 28 L/s per room for the hotel and 10 L/s per person for the restaurant and café
- 10 L/s per person for the office spaces
- 10.8 L/s per person for the gym.

These ventilation requirements have been sized to meet minimum regulations, however there is capacity within the proposed development for the ventilation units to comply with the British Council for Offices - BCO Guide 2014 which is more onerous. The BCO Guide specifies fresh air rate of 12 l/s/person at 1 per 10 m² occupancy (although there is design flexibility within this).

The fresh air intake and exhaust ducts will be well insulated from the AHUs to the point of intake/discharge. Fresh air intakes will be at the upper ground floor level towards Wicklow Street (for the hotel) and roof level (for the offices and gym) in order to minimise ingress of air pollutants from the main roads (Gray's Inn Road and Swinton Street). Exhaust air discharge will terminate at the same levels suitably distanced from the fresh air intakes, in line with the recommendations of industry standards.

The fresh air supply duct from the AHUs to the served spaces unit will be well insulated when running vertically through an adequately sized ventilation riser. The fresh air supply duct will run horizontally at high level in the served spaces to final terminations in every space requiring ventilation.

The extract rates from the different rooms will meet the minimum Part F requirements as stated in Section 3.3. Figure 3 shows typical ceiling void requirements for office spaces.

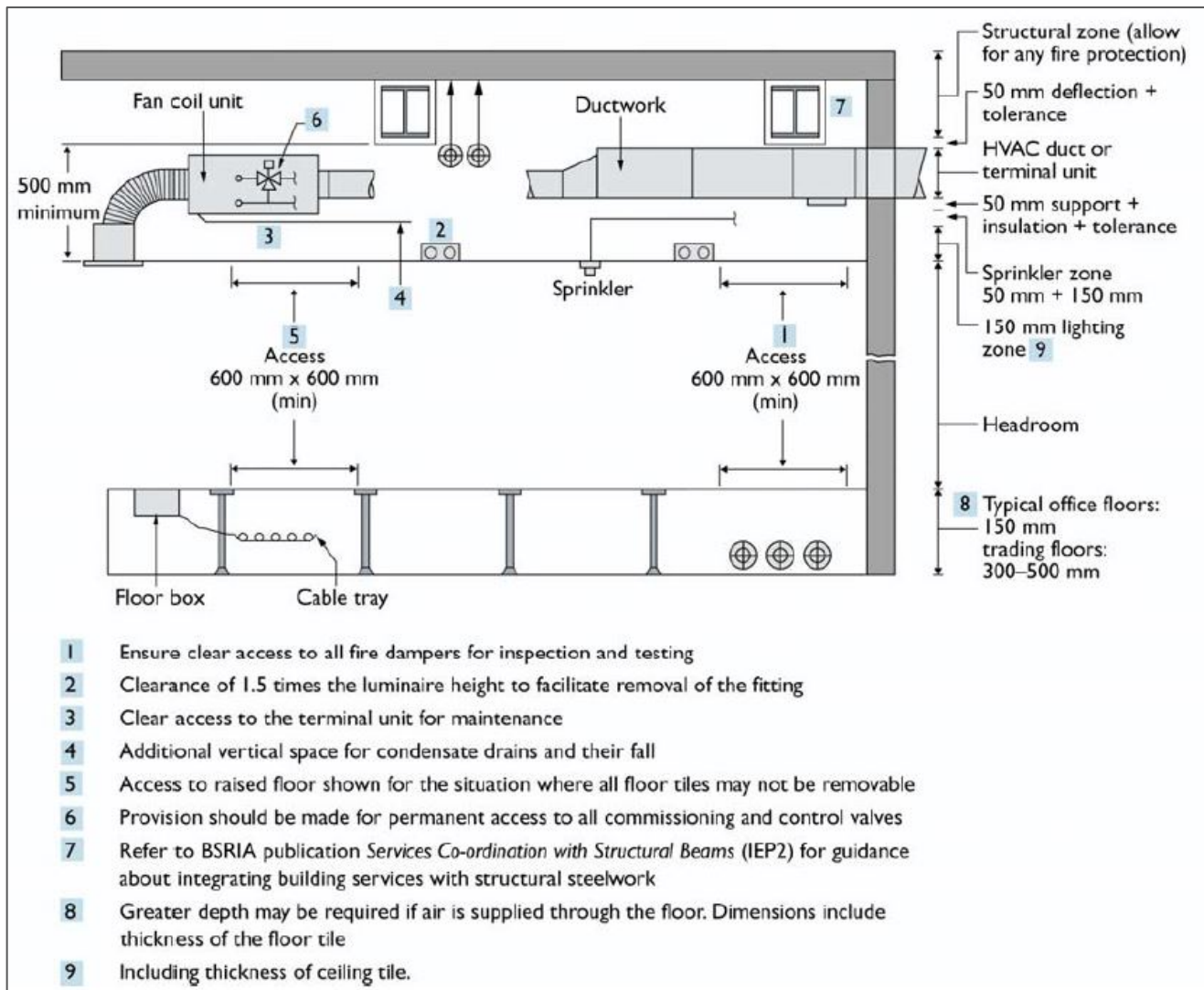


Figure 3: Typical service void for offices (excludes smoke clearance ductwork)

The hotel's restaurant will be served by a dedicated commercial kitchen extract unit. The fresh air to the restaurant seating area and to the kitchen will be supplied via a dedicated supply air handling unit (AHU). The commercial kitchen shall be kept negatively pressurised compared to the restaurant seating area. The units are proposed to be located in the basement plant rooms.

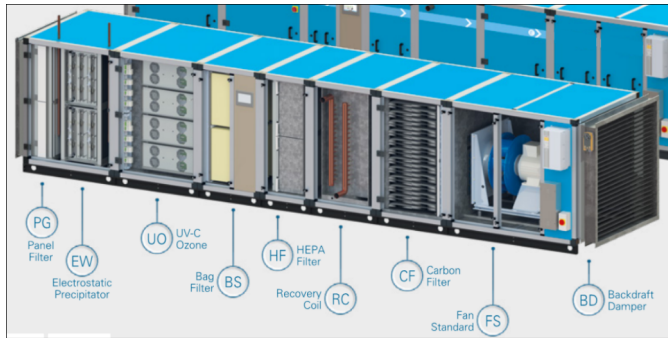


Figure 4: Commercial kitchen extract unit



Figure 5: Supply Air Handling Unit

The fresh air intake duct will be located at the upper ground floor at high-level towards Wicklow Street in order to minimise ingress of air pollutants from the main roads. It will also be ensured that the separation distance between the intake and exhaust terminations prevents the re-entrainment of exhaust air, in line with the recommendations of industry standards.

The fresh air supply duct from the AHU to the restaurant unit will be well insulated when running vertically through an adequately sized ventilation riser. The fresh air supply duct will run horizontally at high level in the restaurant unit to final terminations in every room requiring ventilation.

The commercial kitchen extract duct will be fire rated in line with industry standards and will be routed from the kitchen to the extract AHU through an adequately sized ventilation riser.

The extract rate shall be in line with the requirements of DW172 (2018) and other relevant industry standards.

Acoustic measures, including ductwork attenuators and anti-vibrational mounts, will be adopted if required at the next design stage to mitigate potential noise impacts within the commercial space, to the residential tenants and to neighbouring sensitive receptors. The measured background noise levels and target noise levels are to be advised by the acoustic specialist.

4.2 RESIDENTIAL APARTMENTS

The dwellings are proposed to be mechanically ventilated by a local mechanical ventilation with heat recovery (MVHR) unit. Louvres for fresh air intake and exhaust will be located on the façade at high level within the apartment.

The block A apartments intakes shall be located on the façade facing the communal courtyard in order to minimise ingress of air pollutants from Swinton Street. In addition, an NOx and PM2.5 filtration shall be provided to the ventilation system where required by the Air Quality Consultant.

A few of the Block A apartments may risk overheating in summer and due to noise and air quality concerns is deemed not acceptable to rely on opening the windows in case of overheating. Therefore, it is proposed that the MVHR systems serving these apartments are provided complete with a cooling module for overheating mitigation. This approach is subject to B. Control approval.

Air will be supplied into the living room and bedrooms and extracted from bathrooms, kitchens and utility cupboards. MVHR units will run continuously in the trickle mode operation and will be boosted in wet rooms on demand or via a humidity sensor. The ventilation rates will meet the Approved Document Part F requirements as stated in Section 3.2 and the specific fan power for all mechanical ventilation equipment shall be in compliance with the Building Regulations Domestic Ventilation Compliance Guide. Acoustic measures, including ductwork attenuators, will be adopted if required at the next design stage to mitigate potential noise impacts within the apartments and to neighbouring sensitive receptors. The measured background noise levels and target noise levels are to be advised by the acoustic specialist.

The MVHR units are proposed to be located in the utility cupboard of each apartment and will be accessible. Ductwork inside the apartments will run horizontally in ceiling voids to serve the spaces via air valves. A clear ceiling void depth of 250mm is required in the apartment living rooms and bedrooms to allow for ductwork runs and 400mm is required in corridors and bathrooms to allow for ductwork crossovers. A kitchen recirculation hood is proposed for the kitchen to filter grease from cooking.



Figure 6: Residential MVHR Unit

4.3 PLANT AREAS VENTILATION

The plantrooms are proposed to be provide with mechanical extract to meet the manufacturer's requirements. Louvred doors/walls will allow make-up air ingress.

Acoustic measures will be adopted as required at the next design stage to mitigate potential noise impacts from the development's plantrooms to the tenants or neighbouring sensitive receptors. The measured background noise levels and target noise levels for plant equipment are to be advised by the acoustic specialist.



Figure 7: Louvred Plantroom

4.4 SMOKE CLEARANCE STRATEGY

The basement levels are assumed to be provided with a mechanical smoke ventilation system. Fire rated ductwork and smoke fans will be provided.

The stairwell smoke ventilation strategy for the hotel and residential blocks is assumed to have vertical smoke shaft to ventilate the lobbies adjoining the staircase. An automatic opening vent (AOV) will also be located at the head of the stairway to vent to atmosphere. The dimensions of the smoke shaft, AOV and all ventilation openings shall meet the requirements from Approved Document Part B of the Building Regulations.

If a mechanical smoke ventilation system is used to reduce the smoke shaft dimensions, then a smoke fan will be located on the roof.

The final smoke control strategy will need to be confirmed by Building Control and Fire Consultant.

5.0 CONCLUSION

The ventilation strategy for 330 Gray's Inn Road will incorporate mechanical ventilation for all of the apartments and occupied commercial spaces. Acoustic attenuation will be advised, if required, at the next design stage by the acoustic specialist.

The commercial areas (hotel, offices and gym) have been proposed to be mechanically ventilated by multiple air handling units (AHU) located in the basement levels. Fresh air intakes will be at the upper ground floor level towards Wicklow Street (for the hotel) and roof level (for the offices and gym) in order to minimise ingress of air pollutants from the main roads (Gray's Inn Road and Swinton Street). Exhaust air discharge will terminate at the same levels suitably distanced from the fresh air intakes.

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Each apartment is proposed to have a local mechanical ventilation with heat recovery unit (MVHR) with fresh air and exhaust terminations on the external façade. NO_x and PM_{2.5} shall be provided in line with the Air Quality Consultant requirements.

Final smoke control strategy will be confirmed by Building Control and the Fire Consultant.

The ventilation strategy described within this report is to be designed in accordance with the available information at RIBA Stage 3 design. As the overall building design progresses the design intent highlighted in this ventilation strategy must be maintained otherwise an amendment to the planning application maybe required.

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