First Street South, Block C

Mechanical & Electrical Services

RIBA Stage 2 Ventilation Strategy

Project Number:	L1513
Document Ref:	L1513-ABA-ZC-ZZ-RP-M-57001
Engineer:	P.Abel/ S. Boswarva
Revision:	P02
Issue Date:	31-10-2023

Abacus Consult Limited

Project: **First Street South, Block C, Student Accomodation, Manchester**

Subject: Stage 2 M&E Concept Design – Ventilation Strategy

Prepared for: Downing Living (Manchester South) Limited Partnership Incorporated

Revision	Issue/Revision Description	Prepared By	Approved By	Issue Date
P01	Issued for Planning Approval	P. Abel	P. Abel S. Boswarva	19/10/2023
P02	Issued for Planning Approval	P. Abel	P. Abel S. Boswarva	31/10/2023

CONTENTS

1.0 Introduction

2.0 Air Quality Considerations

3.0 Acoustic Considerations

4.0 Proposed Ventilation Solutions

5.0 Appendix A

Introduction

This document is issued to provide details of the proposed ventilation systems to be designed and installed in the First Street Block C Student Accommodation development in Manchester City Centre.

Downing intend to submit planning for the erection of 1no. student accommodation block 28 storeys with associated amenity areas. The total number of beds will be 555, 56% of which will be studios with the remaining 44% cluster bedrooms.

This report forms part of the full planning application and is intended to set out the principles of the ventilation systems in accordance with Building Regulations, project specific acoustic report and air quality report.

This report will form the basis of further design stages of ventilation services for the project.

Building Regulations AD F Requirements Overview

Building Regulations AD F requires that an adequate means of ventilation is provided for people in the building.

Approved Document F adopts the following strategy: -

- Extract ventilation from rooms where moist water vapour and/or pollutants are released due to activities such as cooking, bathing or photocopying. This is to minimise the spread to the rest of the building. This extract may be either intermittent or continuous.

- Whole building/dwelling ventilation to provide fresh air to the building and to dilute and disperse residual water vapour and pollutants not dealt with by extract ventilation as well as removing water vapour and other pollutants which are released throughout the building (e.g. by building materials, furnishings, activities and the presence of occupants). Whole building/ dwelling ventilation provides nominally continuous air exchange. The ventilation rate may be reduced or ceased when the building is not occupied. It may be necessary to purge the air when the building is re-occupied.

- Purge ventilation throughout the building to aid removal of high concentrations of pollutants and water vapour released from occasional activities such as painting and decorating or accidental releases such as smoke from burnt food or spillage of water. Purge ventilation is intermittent, i.e. required only when such occasional activities occur. Purge ventilation provisions may also be used to improve thermal comfort, although this is not controlled under the Building Regulations.

This ventilation strategy can be delivered by a natural ventilation system or a mechanical ventilation system or a combination of both as follows: -

- Continuous mechanical extract (MEV) with provision of purge ventilation via openable rapid vent panel.

- Continuous mechanical supply and extract with heat recovery (MVHR) with provision of purge ventilation via openable rapid vent panel.

Purge ventilation is defined as manually controlled ventilation of rooms or spaces at a relatively high rate to rapidly dilute pollutants and/or water vapour. Purge ventilation may be provided by natural means (e.g. an openable window) or by mechanical means (e.g. a fan). Purge ventilation provision is required in each habitable room and should be capable of extracting a minimum of four air changes per hour (ac/h) per room directly to outside. Normally, openable windows or doors can provide this function, otherwise a mechanical extract system should be provided.

Purge ventilation on this development is dealt with primarily by opening rapid vents. If there are any shortfalls then this will be made up by the mechanical systems.

2.0 Air Quality Considerations

The site is located in Manchester City Centre adjacent to the A57M Mancunian Way. Because of this close proximity to busy traffic it is important that the ventilation systems are designed to deliver clean fresh air into the building. The RPS Air Quality Report (AQR) has been considered when producing this report and the following has been extracted-:

The results of modelling indicate that the annual-mean limit value for NO2 will be exceeded at:

- LEVEL 01 - All residential units (2 studios, 7 cluster bedrooms, 2 cluster kitchens).
- LEVEL 02 - 2 cluster kitchens, all cluster bedrooms and the studio closest to the cluster bedrooms on the west side.
- LEVEL 03 - 2 cluster kitchens and the two cluster bedrooms closest to the cluster kitchen on the west side.

The following mitigation measures are recommended in the above areas to reduce the exposure of future occupants to NO_2 and improve the suitability of the development for its proposed use:

- Provision of air tight (hermetically sealed) windows for the proposed areas listed above. The specification of the windows should not preclude the windows from being open, at the residents' discretion, to allow rapid ventilation.
- Provision of mechanical ventilation for the above areas. Ventilation air should be supplied from an intake point on the building as far away as practicable from the major pollution sources. The intake is commonly specified to be at roof level at the rear of the property. If possible the intakes should be located at an elevated point where the AQS objective is predicted to be achieved.
- If no such intake location described above is possible, then the intake should incorporate NO_2 filters to European Standard EN 13779.

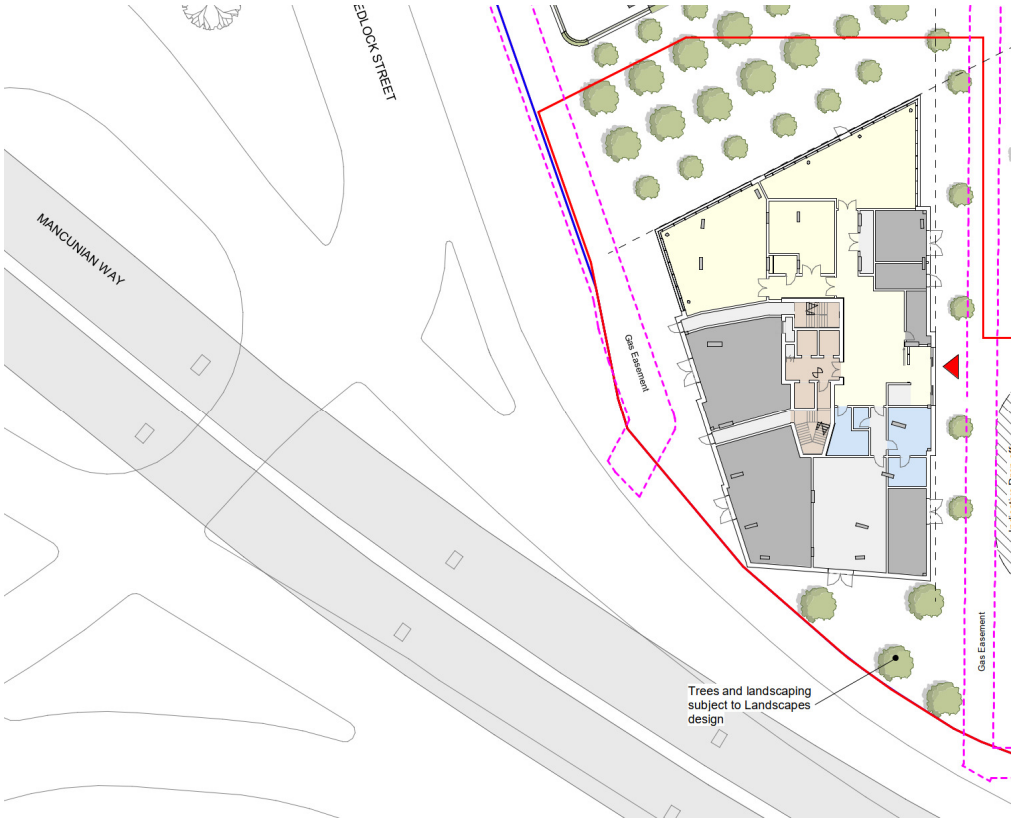
The AQS objectives are predicted to be met at floors 4 and above.

3.0 Acoustic Considerations

Acoustic & Engineering Consultants (AEC) has undertaken a noise assessment report of the project for planning purposes. The report reference is P3921/L32/PJK dated 11 August 2023. Guidance in AVO has been used for the assessment of noise level in living rooms and bedrooms during the daytime.

The site's close proximity to the busy A57M Mancunian Way has impacted the design of ventilation systems from an acoustic perspective.

Site Location



In summary, windows would need to be closed to habitable rooms if the following limits are exceeded:

- 63dB$L_{Aeq,T}$ in the daytime, and
- 49dB$L_{Aeq,T}$ to bedrooms at night

Assessment of Determined Noise Levels

With reference to the previously measured external noise levels, the anticipated free field noise levels affecting each elevation of Block C have been calculated using CadnaA® environmental noise modelling software. The noise map is based on the latest drawings provided by Simpson Haugh architects.

The daytime ambient noise levels are presented on Figures 1 and 2 and night-time ambient noise levels are presented on Figures 3 and 4.

Where the noise level indicators are Red, the daytime or night-time limit for comfort cooling to be provided by an openable window has been exceeded.

This is the case for all bedrooms on all elevations at night.

Where levels are Yellow, openable windows could be considered. However, it is a marginal situation and it should be noted that in the daytime many locations are at the upper limit of 63dBLAeq,T.

Based on the above, alternative means of overheating control are necessary as, due to the sensitivity to noise levels during the daytime and night time periods, opening rapid ventilators cannot be relied upon to control summertime overheating.

Figure 1 – Northern and Eastern Elevations – Daytime Ambient Noise Levels

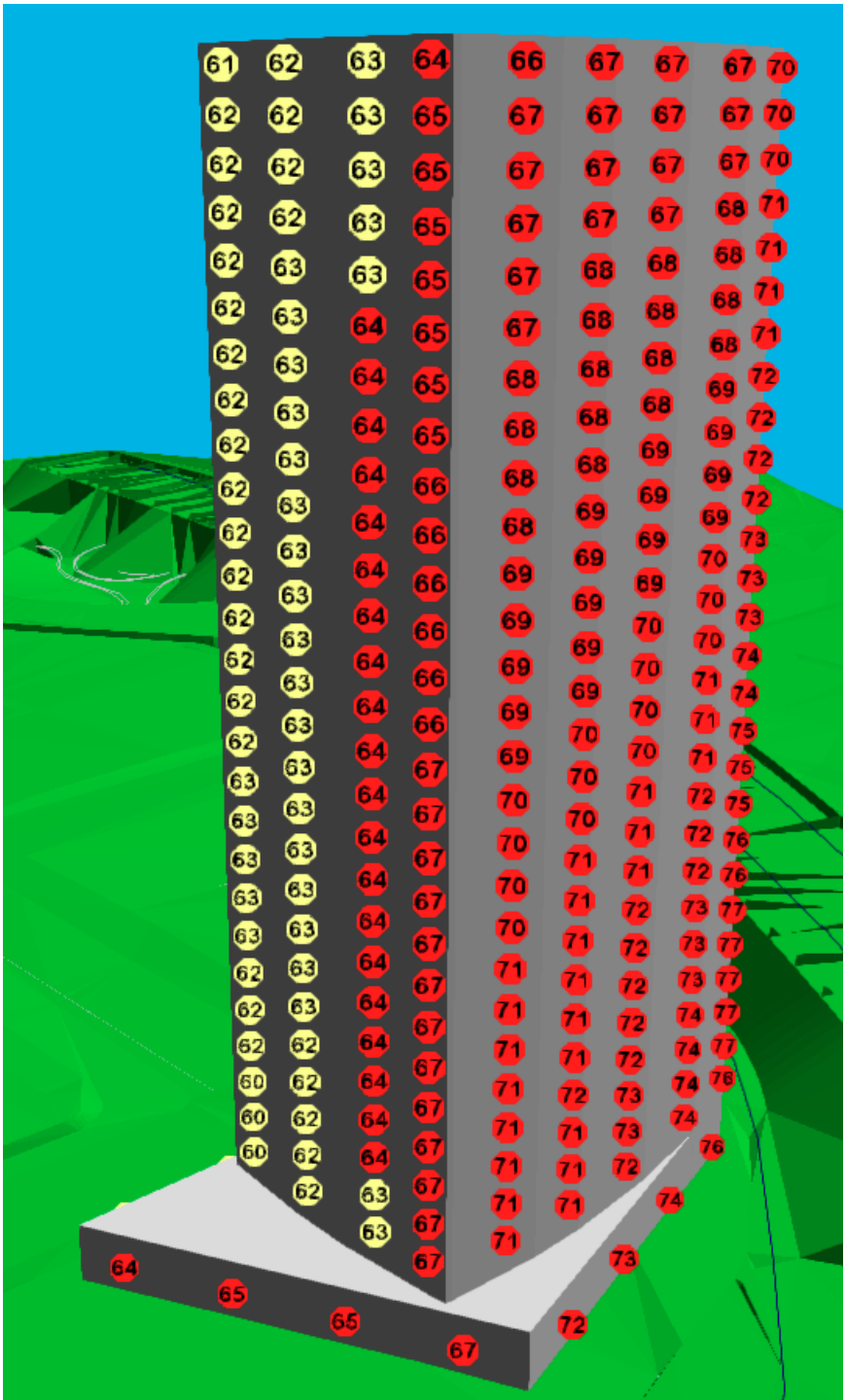


Figure 2 – Southern and Western Elevations – Daytime Ambient Noise Levels

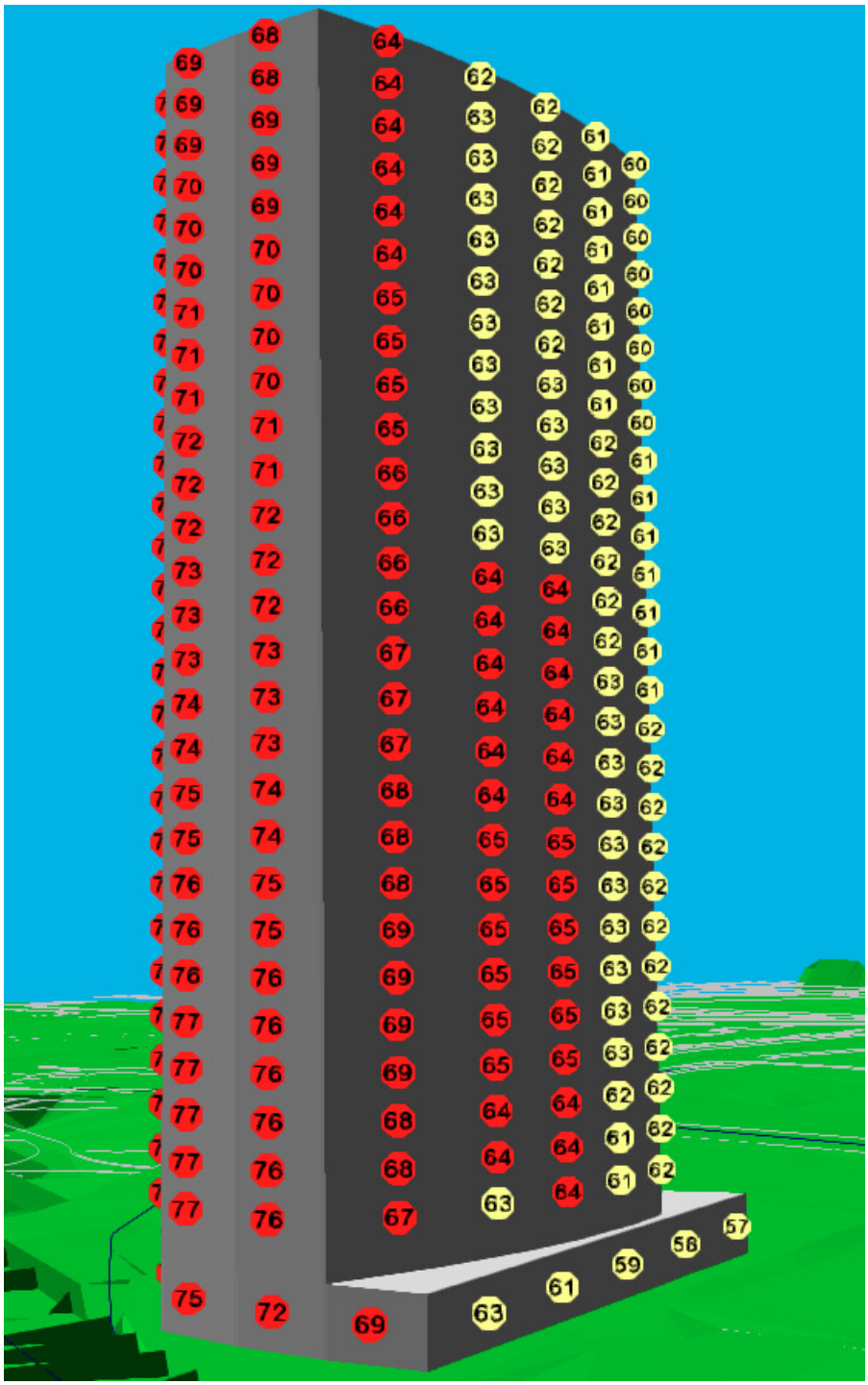


Figure 3 – Northern and Eastern Elevations – Night-time Ambient Noise Levels

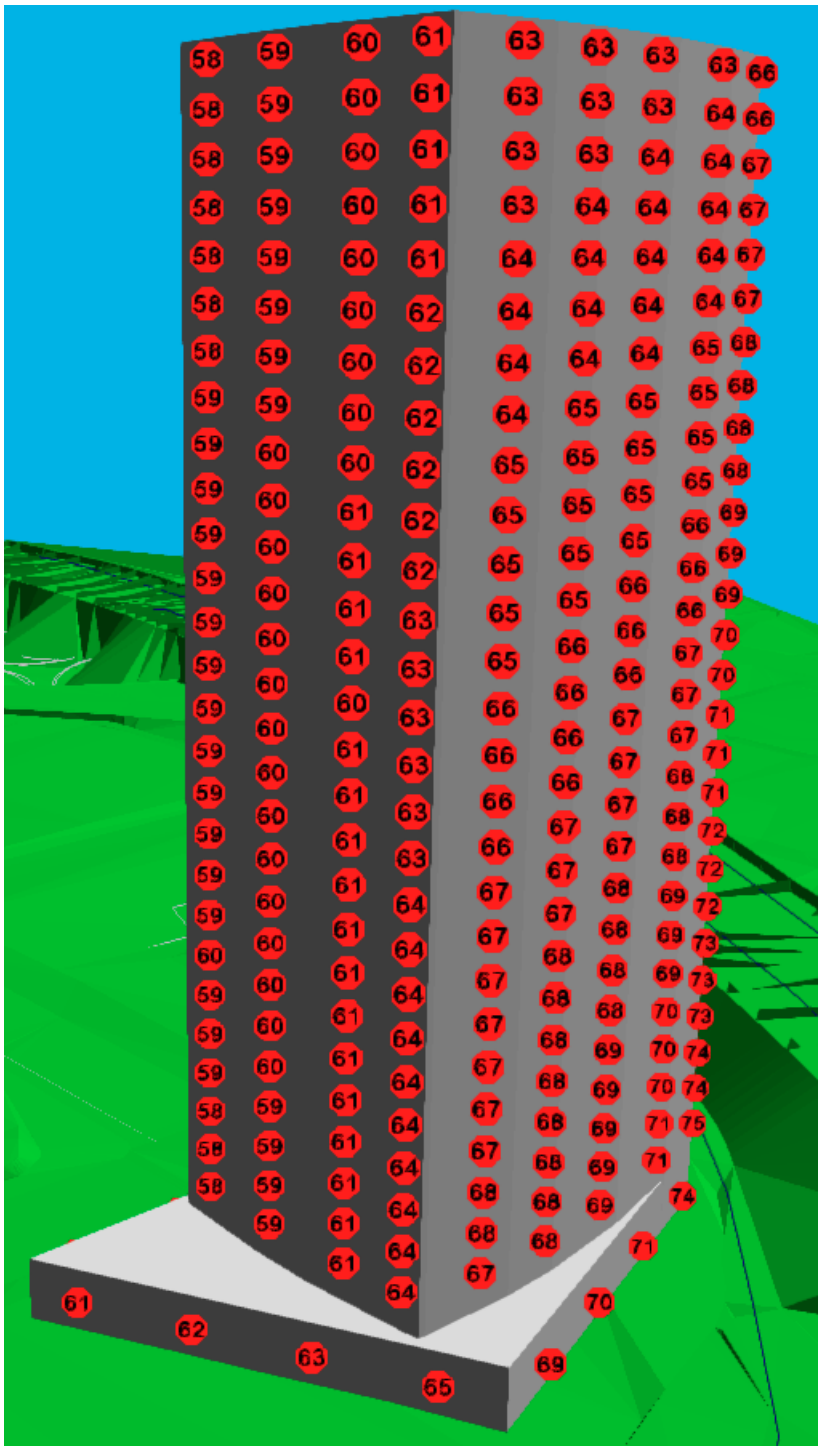
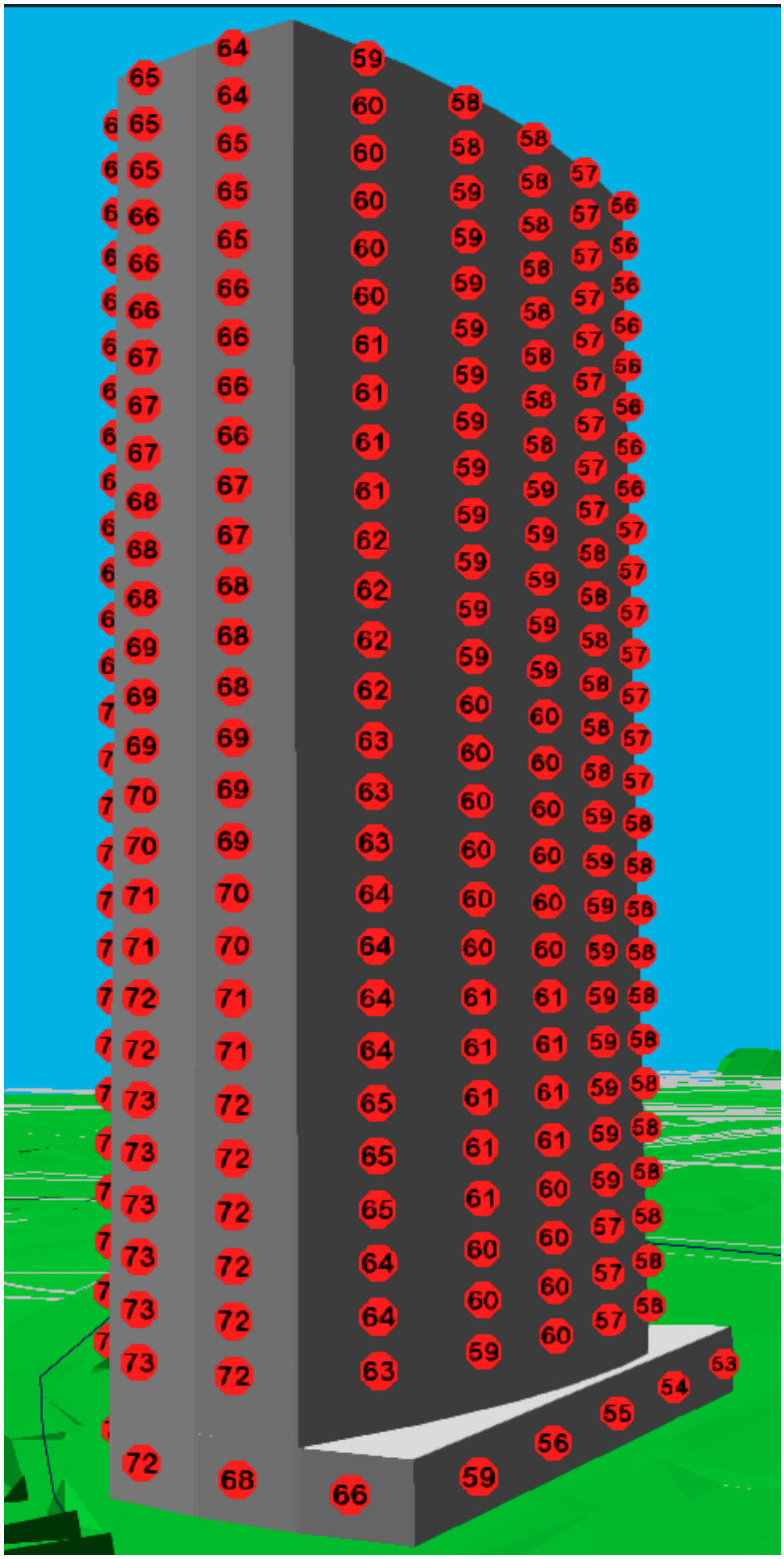


Figure 4 – Southern and Western Elevations – Night-time Ambient Noise Levels



4.0 Proposed Ventilation Solutions

Based on the results of the AQR and Acoustic Report the ventilation systems throughout the development are as follows:-

Landlord areas

Occupied landlord areas such as amenity spaces, management suite, offices etc. shall be provided with mechanical fresh air ventilation at a rate of 10 litres per second per person (l/s/p). Ventilation shall be provided via local heat recovery units mounted within the ceiling voids of the space being served. Air inlets and exhaust shall be ducted to louvres in the space being served to limit pressure drops and resultant energy use associated with long duct runs.

WC extract ventilation shall be provided at a minimum of 10 air changes per hour (AC/hr) with care taken to ensure discharge points do not cause nuisance. Systems shall comprise of single fans serving a single WC or twin fans with auto changeover serving multiple WC's depending upon final architectural layouts.

Bin store mechanical extract ventilation shall be provided at 20 AC/hr with care taken to ensure discharge points do not cause nuisance. Systems shall comprise of twin fans with auto changeover. Make up air shall be provided naturally via louvred doors to the bin store.

Laundry supply and extract ventilation shall be provided in accordance with the laundry specialist contractors requirements.

Smoke ventilation systems shall be provided to corridors and lobbies throughout the block in accordance with AD Part B and the DFC Fire Strategy.

Mechanical smoke extract fans shall be mounted externally at roof level and shall be ducted directly to smoke shafts running down through each floor. Automatic dampers and grilles shall be provided at each floor level to operate under the dictates of smoke sensors. Fire alarm interface shall also be provided.

The smoke ventilation systems shall also have facility for environmental control. This shall provide an element of natural cooling to the corridors to assist with prevention of overheating.

Accommodation Areas

As detailed in the AEC acoustic report reference P3921/L32/PJK, alternative means of overheating control are necessary. Opening rapid ventilators cannot be relied upon to control summertime overheating. RPS air quality report has also defined restrictions to the lower levels 01-03 with regards to locations of air intakes.

Using the above information, the mechanical ventilation systems strategy as follows:

- **Level 00** – MVHR supply and extract ventilation systems to amenity areas and habitable rooms such as staff office, cinema, lounge, gym and meeting room

- **Level 01** – MVHR supply and extract ventilation systems to amenity areas and habitable rooms such as Study, private dining and lounge.
  All student accommodation clusters and studios, MEV extract ventilation with make up air via ducted fresh air. Ventilation air shall be supplied from an intake point at the rear of the building away from the major pollution sources.

- **Level 02** – 2no. cluster kitchens, all cluster bedrooms and the studio closest to the cluster bedrooms on the west side, MEV extract ventilation with make up air via ducted fresh air. Ventilation air shall be supplied from an intake point at the rear of the building away from the major pollution sources.
  All other studios, MEV extract ventilation with make up air via trickle vents.

- **Level 03** – 2no. cluster kitchens and the two cluster bedrooms closest to the cluster kitchen on the west side, MEV extract ventilation with make up air via ducted fresh air. Ventilation air shall be supplied from an intake point at the rear of the building away from the major pollution sources.
  All other bedrooms and studios, MEV extract ventilation with make up air via trickle vents.

- **Level 04-27** - All student accommodation clusters and studios MEV extract ventilation with make up air via trickle vents.

- Temperature control in all clusters and studios to be provided via Variable Refrigerant Flow (VRF) heat recovery system all in accordance with Abacus Consult drawing FSS-ABA-ZC-ZZ-DR-M-50002-P01_S0 - BLOCK C - TYPICAL ROOM VENTILATION STRATEGY LAYOUT (see appendix A).

- As a minimum, AD Part F flow rates shall be maintained.

- Purge ventilation shall be provided in accordance with AD Part F by use of opening rapid ventilators.

External Design Conditions

Season	External Design Temperature
Winter	-5°C fully saturated
Summer	+28°C

Internal Design Conditions

Room	Internal Design Temperature	
	Winter	Summer
Cluster Bedrooms	21°C +/- 2°C	23°C +/- 2°C
Studios	21°C +/- 2°C	23°C +/- 2°C
Cluster kitchen/lounge	21°C +/- 2°C	23°C +/- 2°C
Reception/Entrance	21°C +/- 2°C	23°C +/- 2°C
Offices/Management Suite	21°C +/- 2°C	23°C +/- 2°C
Amenity Areas	21°C +/- 2°C	23°C +/- 2°C
WC's	18°C +/- 2°C	No cooling
Staircases (internal)	16°C +/- 2°C	No cooling
Corridors	Unheated	No cooling
Stores	Unheated	No cooling
Plant	5°C to 35°C	5°C to 35°C No cooling

Internal temperatures are dry resultant and measured 1.5 metres above finished floor level.

Noise levels

Any ducted mechanical services system shall be designed to achieve no greater than 30dBL_{Aeq} (NR25) in bedrooms at night and 35dBL_{Aeq} (NR30) in living rooms during the daytime.

Ventilation Rates

All residential areas shall be provided with ventilation rates in accordance with AD Part F as a minimum.

Room	Ventilation System	
	System Type	Control Strategy & Vent Rate
Cluster Bedrooms	MEV with trickle vent make up air	Constant extract rate of 8l/s
Studios	MEV with trickle vent make up air	Trickle extract rate of 8l/s with boost rate of 21l/s activated by pod lights witch and/or pull out cooker hood.
Cluster kitchen/lounge	MEV with trickle vent make up air	Constant extract rate of 13l/s
Reception/Entrance	Supply & extract via ceiling mounted MVHR units	10l/s/p supply & extract with CO_2 occupancy detectors
Offices/Management Suite	Supply & extract via ceiling mounted MVHR units	10l/s/p supply & extract with CO_2 occupancy detectors
Amenity Areas	Supply & extract via ceiling mounted MVHR units	10l/s/p supply & extract with CO_2 occupancy detectors
WC's	Extract ventilation, make up via surrounding systems	Constant extract rate of 10AC/hr
Staircases (internal)	AOV at head of staircase	Operates under dictates of smoke ventilation system
Corridors	Incorporate environmental control on smoke vent systems	Operates under dictates of temperature sensors with fire condition override
Plant	Naturally ventilated via louvres	

5.0 Appendix A – Typical Cluster & Studio Ventilation Concept Layout