FALLOWFIELD STUDENT RESIDENTIAL DEVELOPMENT

Ventilation Strategy Statement



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1 EXECUTIVE SUMMARY

This report outlines the Ventilation Strategy for the new student accommodation blocks that create the Fallowfield Residences Redevelopment.

RPS has been commissioned for the Building Services design development to RIBA Stage 3 through the collaborative process with other design team members.

The development will meet BREEAM *Excellent* and Passivhaus standards.

The design of the MEP services will also achieve significant betterment to the requirements of Building Regulations Approved Document L (to at least the minimum requirement in line with Ene01 for BREEAM Excellent and EPC rating A).

The proposed design solutions, support the University's goals to address the path to net zero carbon and enhance the students' experience in the following ways:

- The design provides natural light to all occupied rooms and background mechanical ventilation with heat recovery to all bedrooms and kitchens.
- Optimised amount of glazing, considering daylighting, carefully controlling glare, solar gain, heat losses, security, safety, and thermal bridges.
- Choice of construction materials to provide a robust and highly insulated structure.
- Prevention of unwanted air infiltration and heat loss through robust construction details.
- Avoidance of gas heating to avail of a decarbonised electrical grid.
- Water heating provided via high efficiency, low-GWP, air-source heat-pumps.
- Roof-mounted photovoltaics (PV) on each Unit providing embedded electricity generation.



Figure 1 – Aerial view of existing site plan

2 INTRODUCTION

2.1 The Site

The proposed Student Residential Development is located in Fallowfield, south of Manchester city centre on the University's, existing Owens Park, Oak House and Woolton Hall sites. The scheme has received outline planning permission for:

- *The phased demolition of existing buildings and phased development of up to 3,300 Purpose Built Student Accommodation bedrooms.*
- *Associated facilities including waste storage, laundry and cycle storage.*
- *Up to 4,500 sq. m of floorspace to be used for ancillary purposes associated with the student residential use of the site (drinking establishment and hot food takeaway)*
- *Ancillary supporting staff accommodation (up to 55 bedrooms)*
- *Up to 1,200 sq. m of ancillary residential dwellings plus associated car parking, hard and soft landscaping, open space, utilities, footpaths and roads.*

A BREEAM "Excellent" rating is targeted for the development (the BREEAM assessment encompassing all residential buildings of the complete site).

Outline Planning permission ref 138126/OO/2023 was approved on 19th January 2024 for the demolition and redevelopment of the site to deliver 3,300 purpose-built student accommodation (PBSA) bed spaces, alongside all supporting infrastructure and ancillary services.

2.2 Applicable Planning Policy

Greater Manchester has committed to achieving carbon neutrality by 2038. Relevant planning documents include the following:

- Manchester City Council: Local Development Framework, Core Strategy Development Plan Document; adopted 11th July 2012 (incl 2024 amendment)
- PLACES FOR EVERYONE, joint development plan document for Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan, 2022 to 2039; adopted 21st Mar 2024

Places for everyone requires all new developments to be net zero carbon by 2028.

2.3 Ventilation Design Criteria

All MEP services designs and systems are to be provided in accordance with the Employers Requirements, current UK Legislation, Building Regulations' Approved Documents, British Standards, Technical Standards, Codes of Practice, engineering institutes' good practice guidance.

Design Life

All Mechanical & Electrical Building Services will be designed to achieve the design life detailed in CIBSE Guide M.

HVAC Design Occupancy Levels

Careful attention has been provided to the engineering services design to the bedrooms to ensure they provide a high-quality living environment and meet the aspirations for maintaining and enhancing the experience of students at the University.

Specifically, the ventilation systems shall be in full compliance with the requirements of:

- Approved Documents B, F & O
- CIBSE Guides
- Relevant British Standards
- DEFRA Guidance Document "Guidance on the Control of odour and Noise for Commercial Exhaust Systems"

Additionally, the design of the ventilation system shall be in full consideration of the criteria for overheating in accordance with Approved Document Part O for the student accommodation,

Overall, the ventilation strategy shall support the overall "well-being" and safety of the occupants and enhance the environment of the spaces, support low energy and carbon solutions.

Where deemed appropriate, the design shall attract relevant credits for BREEAM and promote good practice ventilation strategies throughout the development.

3 VENTILATION PROPOSALS

3.1 Ventilation Rates

The ventilation rates used will be applied in accordance with Building Regulations - Ventilation (2021), Approved Document F, DW172 and in compliance with the Passivhaus requirements. (See further sections discussing route, demonstrating ADF compliance)

3.2 Residential Blocks

Ventilation flow rates shall be as follows:

Bedroom Studios*	6 l/s Supply (boost to 8 l/s).
Bedroom Studio Ensuite	6 l/s Extract (boost to 8 l/s).
KLD (Kitchen Living Dining)	15 l/s supply (boost to 20 l/s).
KLD (Kitchen Living Dining)*	15 l/s extract (boost to 20 l/s).
Cooker hoods	Recirculating.
Living spaces (resi life apartments)	8 l/s supply and extract.
Plantrooms (ground floor)	Naturally ventilated via louvred doors.
Linen stores	15 air changes per hour supply and extract.
Riser hub (comms rooms, no AC)	100 l/s supply (extract via duct to corridor).
Comms rooms (with AC)	10 l/s supply (extract via duct to corridor).
Cleaner stores	10 l/s extract or 100 l/s extract to match riser hub or comms room (supply via duct from corridor).
Refuse stores	10 air changes per hour mechanical extract.
All spaces	0.1 air changes per hour.

In addition to the above flow rates, natural ventilation shall be provided via openable windows to all bedroom studios and KLD's where permitted within the acoustician's report.

3.3 Bedroom Corridors

Residential block bedroom corridors to be ventilated by adventitious means from bedrooms.

"*Passivhaus guidance suggests that all rooms within the thermal envelope must be ventilated either directly or indirectly with 'sufficient volume flow rate'. No specific flow rates are provided for cluster corridors in student residential accommodation, though elsewhere in the Passivhaus design guidance it notes that 'circulation areas outside of dwellings…..at least a 0.1 fold air change rate must be used'.*

0.1 air changes per hour to cluster bedroom corridors equates to a flow rate of circa 2 l/s for a standard 10 bed cluster. This flow rate is deemed very small and therefore an indirect approach to compliance will be provided where an additional 1 l/sec above Approved Document Part F requirements is supplied into 2 of the 10 bedrooms off the corridor, therefore providing a marginal over pressurisation of these bedrooms. This 'additional air' will then be allowed to leak into the cluster corridor via cracks around the bedroom doors (a free area of bedroom door cracks of circa 0.00067m2 only is necessary for 1 l/sec to pass through at a velocity of 1.5m/sec). The extract flow rate in the kitchen will be increase by 2 l/sec so the 'additional air' will be drawn back into the cluster MVHR through the cracks in the kitchen door (a free area of kitchen door cracks of circa 0.00134m2 only is necessary for 2 l/sec to pass through at a velocity of 1.5m/sec) and into the kitchen extract.

It is highlighted that opening and closing of the doors to the bedrooms and the kitchen while in normal use will also provide in excess of 0.1 ach of transferred ventilation to the cluster corridor".

3.4 Local and Central Hubs

Office / Study spaces	10 l/s/person supply and extract.
Kitchenettes	10 l/s/person supply and extract plus 15 l/s extract to the kitchen area (non commercial)
WC's	6 l/s/WC extract or 6 air changes per hour whichever is the greater.
Cleaner stores	10 l/s extract.
Laundry spaces	As advised by laundry specialist.
Commercial Kitchen	DW172 – airflows as advised by specialist.
Comms rooms (with AC)	10 l/s extract.

3.5 Ductwork Velocities and Pressure Drops – Residential blocks

Residential systems shall comprise Passivhaus certified MVHR units located in the Kitchen Living Dining (KLD) spaces and shall serve the KLD and bedroom studios and ensuites.

Plastic ductwork shall be permitted to cluster bedrooms and KLDs.

The contractor shall demonstrate the complete design, ductwork velocities and pressure losses etc meets the following criteria:

- MVHRs are Passivhaus certified.
- MVHRs achieve specific fan powers in line with building regulations and BRUKL reports.
- Acoustic criteria is met.

Primary ductwork within the kitchen living dining area connected to the MVHR and up to the bedroom boundary wall shall all be fully acoustically and thermally insulated and hidden within a bulkhead.

Ductwork within bedrooms to be acoustically insulated as necessary to comply with acoustic criteria.

Roof Mounted AHU's serving cleaner stores, corridors etc shall have thermally insulated ductwork in line with Passivhaus requirements.

3.6 Ductwork Velocities and Pressure Drops – Local and Central Hubs

Non-Domestic buildings

- Main Duct 5.0 m/s maximum and 1.0 Pa/m maximum
- Branch Duct 4.0 m/s maximum and 1.0 Pa/m maximum

The contractor shall demonstrate that the design achieves the acoustic criteria.

Commercial kitchen to comply with DW172.

Commercial kitchen supply and extract ductwork velocities shall be in line with DW172 table 11, duct access hatches shall be provided at 2m centres, and the kitchen exhaust shall discharge vertically above the roof level with a discharge velocity of 12 to 15 m/s.

Table 11 Duct Velocities		
	Supply	Extract
Main Runs	6-8 ms^{-1}	6-9 ms^{-1}
Branch Runs	4-6 ms^{-1}	5-7 ms^{-1}
Spigots	3-5 ms^{-1}	5-7 ms^{-1}

3.7 Ductwork Fire/Smoke Dampers

Automatic actuated smoke dampers will be installed to distribution ductwork which passes through fire compartmentation where one side of the compartmentation forms part of the escape route for the building occupants.

Thermal link automatic fire dampers will be installed to distribution ductwork which passes through fire compartmentation where neither side of the compartmentation forms part of the escape route.

Intumescent fire sleeves which are approved by the fire engineer will be installed to plastic ductwork which passes through fire compartmentation which is self-contained within a cluster. (a cluster typically comprises of one KLD and up to 10 studio bedrooms with ensuites).

Fire rated ductwork or fire rated ductwork wrapping which is approved by the fire engineer will be installed to ductwork which passes through escape routes which are within a cluster.

The central hub commercial kitchen extract ventilation ductwork and all duct mounted components will be fire rated in line with DW172 and the fire engineers report.

3.8 Smoke Ventilation

In line with the Fire Strategy report, mechanical smoke extract ventilation systems shall be provided to protect the escape lobbies within each accommodation building.

4 VENTILATION SYSTEM DESCRIPTIONS

4.1 Student Accommodation Bedroom Cluster Ventilation Services

A continuous mechanical supply and extract incorporating a heat recovery (MVHR) system will provide ventilation to the student accommodation bedroom clusters in accordance with the requirements of Building Regulations Approved Document Part F – Ventilation Volume 1.

The MVHR will operate in boost mode to provide higher rates of ventilation when either the cookermiser control device is activated or the MVHR integral return air humidity sensor is activated.

The MVHR units shall be **Passivhaus certified.**

Self-contained **peak lop cooling** shall be installed to the MVHR units where required to provide a complete installation which complies with the requirements of TM59 overheating calculations and approved document part O and the acoustic report (typically where windows are required to be closed for compliance with the acoustic report).

The peak lop cooling device shall provide sufficient cooling for the system to achieve compliance with TM59, as such, the peak lop cooling device operates to reduce space temperatures below a pre-determined condition and does not provide end user (student) adjustable temperature control.

The peak lop cooling devices shall comprise of a refrigerant cycle utilising R32 refrigerant gas. The evaporator coil shall be located in the supply air stream and the condenser coil shall be located in the exhaust air stream in line with the manufacturer's installation manual. The peak lop cooling device shall be controlled by the average return temperature sensor integral to the MVHR unit. The peak lop cooling device shall operate automatically based on a pre commissioned temperature profile.

The peak lop cooling devices shall not have an outdoor component, rather, the peak lop cooling devices shall utilise the MVHR fresh air inlet and exhaust air outlet duct terminations.

The MVHR unit shall serve each cluster of up to 10 No. bedrooms and associated Kitchen Living Dining (KLD) space. The MVHR unit shall be wall mounted within an easily accessible cupboard formed in the KLD, providing continuous background ventilation with extract from ensuites & kitchen and supply air to bedrooms and living/dining space.

Suitable kitchen recirculation extract hoods with filtration will be provided to the KLD Kitchens areas to limit exposure to odours, smells, moisture and particulates. Each hood will operate automatically (via cookermiser control devises) when the cooking appliance is on (i.e. drawing power).

A low velocity insulated ductwork system will distribute the air within the Bedrooms, ensuites and KLDs.

Intake and exhaust louvres will be installed at high level in the external façade and set out to minimise the risk of cross-contamination of the air streams.

The internal ductwork within the studio units shall be suitable steel or plastic low profile rectangular with air valve type grilles and diffusers. Final branches will incorporate bends/attenuated lining, to provide adequate cross-talk attenuation between rooms and comply with the acoustic report.

Silencers or acoustic flexible ducting shall be installed to achieve the specified acoustic criteria.

System design shall ensure that the requirement for service maintenance access panels is designed out wherever possible. In areas where the only solution is to utilise services access panels, panels shall be installed in a discreet manner, be co-ordinated with the architecture, fixtures, fittings and finishes and be colour coded. All RAL colours to be agreed in writing with the Architect prior to ordering.

Within the clusters, fire & smoke dampers and / or fire sleeves / collars will be provided in all ductworks that crosses fire compartmentation lines in full compliance with the Fire Strategy Report.

All fire sleeves, fire collars, fire dampers, smoke dampers, sealant etc to be approved by the Fire Engineer prior to procurement and installation.



Figure 2 - Typical MVHR unit providing extract to ensuites, supply air to bedrooms and background ventilation to KLD

4.2 Student Accommodation Communal Corridors, Stairwells, Store Rooms, etc

All spaces shall be provided with a minimum 0.1 air changes per hour to comply with Passivhaus requirements. This shall be achieved either through natural ventilation, adventitious ventilation (via openable bedroom doors) or mechanically.

A roof mounted supply and extract air handling unit shall be installed to each residential building. Each with heat recovery, integral controls, filters, fans and weatherproofing etc shall provide ducted mechanical supply and extract ventilation to the cleaner's stores, linen stores, land locked corridors (where not adjacent to bedroom doors and not naturally ventilated) etc.

Unit or duct mounted silencers shall be installed to meet the acoustic criteria.

Ductwork shall generally be spiral wound with insulation to prevent thermal bridging and achieve the requirements set out in the Passivhaus reports. Acoustic and thermal insulation shall be provided as appropriate. Air terminals shall be finished to a standard to be agreed by the architect.

Ductwork complete with smoke dampers will enable air from one space to ventilate an adjacent (transient) space as appropriate.

The systems shall be controlled via the BMS system.

Fire / smoke dampers will be provided in fire compartmentation lines to comply with the fire strategy and Approved Document 'B' guidance.

4.3 Student Accommodation Refuge Stores

Refuse Stores will be served by dedicated extract fans complete with duct mounted silencers to ensure adequate measures are provided to control odour. The fans will be located at high level within the room and the doors will be louvred to provide supply air make-up within the area. The high-level exhaust louvres will be located to ensure that cross-contamination does not occur with adjacent fresh air inlet louvres and openable windows.

Refuse fans will be controlled via the BMS, via a dedicated time schedule.

4.4 Student Accommodation Plantrooms

Plantrooms shall be naturally ventilated via fully louvred external doors.

4.5 Riser Hub Comms Room and Cleaner Store (no air conditioning)

Riser hub comms rooms with no air conditioning will be heated and cooled via the communal corridor ventilation system.

The riser hub rooms will have mechanical supply ventilation which shall terminate via a suitable air valve or grille with the space.

A free inlet duct shall connect the riser hub comms room with the adjacent corridor area.

A free inlet duct shall connect the corridor area with the cleaner store.

Where free inlet ducts pas through a fire compartmentation, fire dampers shall be provided. Where the corridors form part of the escape route, these fire dampers shall be smoke fire dampers and in compliance with the fire strategy report.

From the cleaner store, the communal corridor ventilation system shall provide mechanical extract ventilation.

4.6 Local Hub Ventilation Systems

Local hubs will rely on mechanical supply and extract ventilation systems to serve occupied and ancillary spaces (study spaces, staff rooms).

Ceiling mounted MVHR units will be provided and operate on demand via the BMS.

The MVHRs shall be selected to achieve the design duty running at medium speed.

The systems shall be controlled on occupancy via room-mounted CO_2 sensors and presence detection.

Fire dampers will be provided in fire compartmentation lines to comply with the fire strategy and Approved Document ‘B’ guidance.

4.7 Local Hub Toilet and Cleaner Store Ventilation Systems

Communal toilet/cleaner store areas will be served by dedicated extract fans to remove odours. Undercut doors will be provided as appropriate, to allow ingress of supply make-up air from the adjacent circulation areas to the toilets.

Toilet extract fans serving multiple rooms will be controlled via the BMS, via presence detection, timer control and over run.

4.8 Local Hub Laundry Supply and Extract Ventilation Systems

Each local hub laundry room will have a laundry service corridor to the rear of the machines. Each service corridor will be provided with a dedicated mechanical extract fan to the laundry specialists specification and connected to the BMS.

Make up air to the service corridor will be via an air transfer louvre mounted at low level in an external wall to the laundry specialists and the architect’s specification.

The occupied laundry area shall include wall mounted extract fans to exhaust air directly to atmosphere. Supply air make up shall be provided via undercut doors to the adjacent spaces or an intumescent air transfer grille in the internal wall to the study space.

The wall mounted extract fans shall operate on demand via PIR sensors and the BMS with over run.

4.9 Central Hub Ventilation Systems

The Venue and central dining space shall be mechanically ventilated via a roof mounted supply and extract air handling unit. The AHU shall be complete with heat recovery, integral controls, filters, fans and weatherproofing etc and shall provide ducted mechanical supply and extract ventilation to The Venue and dining spaces etc.

Study spaces, offices and toilets shall be mechanically ventilation via MVHR units (dedicated MVHR unit to toilets) mounted at high level complete with integral controls.

MVHR units shall be selected to achieve the design duty running at medium speed.

Ventilation systems shall include all necessary silencers to achieve noise criteria detailed in the acoustic report and to provide cross talk attenuation to toilet facilities.

The system shall distribute air via ductwork and terminal grilles and diffusers with a finish to be agreed with the architect. Ductwork shall be thermally and acoustically insulated as appropriate.

The systems shall be controlled on occupancy via room-mounted CO_2 sensors and presence detection and be operable via the BMS system.

Fire dampers will be provided in fire compartmentation lines to comply with the fire strategy and Approved Document ‘B’ guidance.

Undercut doors will be provided as appropriate, to allow ingress of supply make-up air from the adjacent circulation areas.

The systems shall be controlled via the BMS system.

4.10 Kitchen Supply and Extract Ventilation Systems

Supply and extract ventilation systems shall serve each commercial kitchen in Hub buildings.

The kitchen equipment specialist to determine the required supply and extract ventilation duties.

The extract ventilation system shall include commercial grade stainless steel kitchen canopies with discharge air to atmosphere at roof level.

The extract system will be designed to DW172 and will comprise of fire rated ductwork, fire rated silencers, a roof mounted kitchen extract fan and a high velocity vertical discharge.

Supply air shall be provided to the kitchen space via a dedicated roof mounted AHU, incorporating filtration, heater coil, supply fan and controls.

The ventilation systems will be controlled via the BMS, by manual switching in the kitchen providing off, low and high-speed settings; the supply fan will be interlinked to suit the extract.

4.11 General Requirements for Ventilation Systems

In general, all general ventilation and extract ductwork will be provided to DW144 (galvanised steel) and DW 154 (plastic).

Ventilation to commercial style kitchens will be to DW172.

The position of exhaust louvres will ensure that cross-contamination does not occur with adjacent supply louvres and openable windows.

Acoustic attenuators shall be provided on all systems as necessary to achieve noise criteria; attenuation may consist of bespoke attenuators or by means of addition duct bends.

Fire dampers, fire & smoke dampers, intumescent door transfer grilles and air transfer ducts will be provided to comply with the fire strategy and Approved Document ‘B’ guidance.

Fire and smoke dampers shall be controlled and monitored via a dedicated control panel located adjacent the fire alarm panel. The dampers shall be interlinked to the BMS system to provide status monitoring.

The fire and smoke dampers shall close, and the associated ventilation plant shall shut down upon receipt of a fire alarm system. Likewise, the dampers shall close, and plant shut down should power to the fire/smoke damper control panel be lost. The fire dampers shall have the ability to be tested externally from the ductwork. Access hatches shall be provided at either side of all dampers.

All fire and fire/smoke dampers shall be CE Marked installed to comply with the fire strategy and in line with manufacturers approved installation details.

Fire dampers, where required to comply with the fire strategy report, shall activate automatically via a thermal link. Fire dampers shall be fail safe.

Smoke fire dampers, where required to comply with the fire strategy report, shall activate automatically via actuators which shall be linked to the fire alarm system with fire rated cabling.

Smoke damper control panels shall be dedicated control panels and shall be installed in positions as agreed with the fire engineer and architect.

4.12 Smoke Ventilation

In line with the Fire Strategy report, mechanical smoke extract ventilation systems shall be provided to protect the escape lobbies within each accommodation building.

These shall be suitably sized and located, incorporating:

- Twin, duty/standby, roof mounted fans.
- Builders work smoke shaft serving all designated stair lobbies.
- Automatic opening vents connecting all designated stair lobbies and smoke shaft.
- AOVs o the head of all stairs.
- In buildings with long corridors/stair lobbies, a dedicated air inlet shaft with AOVS at each level and at head of shaft will be employed.
- The complete smoke control system will be controlled, activated and monitored via a dedicated control system, interfacing with BMS (for condition monitoring) and the fire alarm system.

The smoke ventilation systems dedicated control panel, incorporating fire alarm test facilities, fault identification, individual actuator/louver activated indication. The power supply to the system shall be a dedicated fire rated supply.

The cause and effect of all fire systems including smoke control will be agreed by the fire specialist and approved inspector.



Figure 3 - Typical roof-mounted smoke extract fan system



Figure 4 - Typical Roof mounted AOV



Figure 5 - Typical lobby AOV

Appendix A
Acronyms/Abbreviations

A/C	Air conditioning
ADL	Approved Document L (Building Regulations); referred to as “Part L”
AHU	Air handling unit
ASHP	Air Source Heat Pump
BER/TER	Building Energy Rating/Target Energy Rating (as related to Part L analysis)
Bldg	Building
BMS/BEMS	Building Management (Controls) System/Building Energy Management (Controls) System
BREEAM	Building Research Establishment Environmental Assessment Method
BSRIA	Building Services Research and Information Association
BWIC	Builders-work in connection (with the MEP services)
CAPEX	Capital Expenditure
CIBSE	Chartered Institute of Building Services Engineers
CWS	Domestic Cold-Water Service
DB	Distribution Board
ENWL	Electricity Northwest Ltd
FW	Foul Water (drainage)
HP	Heat Pump
HV	High Voltage
HVAC	Heating Ventilation and Air Condition
LCA/LCC	Lifecycle analysis/Lifecycle costing
LPHW	Low Pressure Hot water (heating
LV	Low voltage
M&E	Mechanical and Electrical Services
MEP	Mechanical Electrical and Plumbing (Public Health) Services
NCM	National Calculation Method
O&M	Operating and Maintenance (Manual)
OPEX	Operating Cost
PPM	Planning Preventative Maintenance
RIBA	Royal Institute of British Architects
RMU	Ring Main Unit
SB	Switch board
SBEM	Standard Building Energy Model
UU	United Utilities