

MPF/PR0665/L02

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Dear Ben

PORT STREET, MANCHESTER – APARTMENT MVHR

I write with confirmation of the results of our acoustic assessment of the MVHR units and associated ancillaries at the Port Street residential development, Manchester.

INTRODUCTION

Fisher Acoustics Ltd has been commissioned by Renaker Build Limited to determine the expected in-room noise levels generated by the proposed Brookvent Aircycle MVHR units to be installed at Port Street, Manchester within typical 1-bed, 2-bed and 3-Bed apartments.

ACOUSTIC CRITERIA

The recommended maximum noise levels within apartments due to building services system are detailed in Fisher Acoustics' report: 'Z0-FAC-A180-RP-XX-002 P02 Port Street, Mcr - Internal Sound Insulation Design', dated 25 August 2022. Table 1 identifies the applicable noise criteria.

Room Type	Spatially averaged noise level (Leq)
Bedrooms (MVHRs in trickle and 'part F' boost mode)	NR 25 (approx. 30dB(A))
Living Rooms (MVHRs in trickle and 'part F' boost mode)	NR 30 (approx. 35dB(A))
Bathrooms (MVHRs in trickle and 'part F' boost mode)	NR 40

Table 1: Maximum allowable internal noise levels due to building services plant

It will be noted that that noise criteria in Table 1 apply to the MVHR when operating in boost mode. For the majority the time, noise levels within the apartment rooms will be lower than those identified in Table 1 as the MVHR will normally operate in background ventilation mode ('trickle' mode). The typical noise level difference between trickle and boost mode is approximately 5dB.

DESIGN AIRFLOW RATES

The design airflow rates for the Brookvent Aircycle MVHR units to achieve the project's ventilation requirements have been advised by AV Unibrak.

Table 2 identifies the reported MVHR airflow rates and applicable fan curve pressures for each system.

Apartment Type	Part F Boost Mode		Purge Mode	
	Flow Rate (Litres/ sec)	Static Pressure (Pa)	Flow Rate (Litres/ sec)	Static Pressure (Pa)
1-bed (Aircycle 1.2)	21	211	45	211
1-Bed Purge fan	-	-	25	55.8
2-bed (Aircycle 1.2)	29	350	45	211
2-bed Duplex (Aircycle 3.1)	37	536	43	500
3-bed (Aircycle 4.1)	37	516	80	365

Table 2: Advised airflow rates and fan curve pressures for all apartment types

SOUND POWER LEVEL DATA – MVHR UNITS

Noise level data for the proposed Brookvent Aircycle MVHR units have been advised by Brookvent Ltd for the proposed flow rates and working pressures. The calculations and acoustic assessments described herein are on the basis that the reported noise levels detailed above are a true reflection of the sound power levels of the MVHRs.

Table 3 identifies the reported sound power levels generated by the proposed Brookvent Aircycle 1.2 MVHR unit that will serve the 1-bed apartments when operating in both 'boost' mode and 'purge' mode.

Duty	System	Sound Power Level (dB(A)) at Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
21 l/s at 211 Pa, Part F Boost Mode	Open Outlet (supply)	-3.3	10.3	27.8	28.9	17.2	13.4	8.4
	Open Inlet (extract)	6.3	25.8	38.0	41.4	38.4	29.8	16.3
	Breakout	1.1	25.7	34.6	33.7	31.5	29.4	19.0
45 l/s at 211 Pa, Purge Mode	Open Outlet (supply)	18.7	21.6	44.3	47.8	36.5	35.3	22.9
	Open Inlet (extract)	24.9	35.8	58.8	60.3	59.3	54.5	39.2
	Breakout	20.8	27.0	58.1	51.5	51.4	48.9	41.6

Table 3: A-weighted Sound Power Levels of Brookvent Aircycle 1.2 MVHR Unit for 1-bed apartment

Table 4 identifies the reported sound power levels generated by the proposed Brookvent Aircycle 1.2 MVHR unit that will serve the 2-bed apartments when operating in both 'boost' mode and 'purge' mode.

Duty	System	Sound Power Level (dB(A)) at Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
29 l/s at 350 Pa, Part F Boost Mode	Open Outlet (supply)	-3.3	10.3	27.8	28.9	17.2	13.4	8.4
	Open Inlet (extract)	6.3	25.8	38	41.4	38.4	29.8	16.3
	Breakout	1.1	25.7	34.6	33.7	31.5	29.4	19
45 l/s at 211 Pa, Purge Mode	Open Outlet (supply)	18.7	21.6	44.3	47.8	36.5	35.3	22.9
	Open Inlet (extract)	24.9	35.8	58.8	60.3	59.3	54.5	39.2
	Breakout	20.8	27.0	58.1	51.5	51.4	48.9	41.6

Table 4: A-weighted Sound Power Levels of Brookvent Aircycle 1.2 MVHR Unit for 2-bed apartment

Table 5 identifies the reported sound power levels generated by the proposed Brookvent Aircycle 3.1 MVHR unit that will serve the 3-bed apartments when operating in both 'boost' mode and 'purge' mode.

Duty	System	Sound Power Level (dB(A)) at Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
37 l/s at 516 Pa, Part F Boost Mode	Open Outlet (supply)	28.7	32.8	47.4	45.8	43.6	34.3	23.8
	Open Inlet (extract)	28.9	36.3	39.8	41.7	38.1	31.2	29.6
	Breakout	26.3	30.2	41.2	40.9	39.0	31.7	22.3
80 l/s at 365 Pa, Purge Mode	Open Outlet (supply)	31.7	39.4	55.1	57.6	54.6	48.2	37.5
	Open Inlet (extract)	30.0	45.3	49.9	53.6	49.3	46.0	42.2
	Breakout	26.0	37.9	51.1	52.6	49.2	43.2	34.4

Table 5: A-weighted Sound Power Levels of Brookvent Aircycle 4.1 MVHR Unit for 3-bed apartment

Table 6 identifies the reported sound power levels generated by the proposed Brookvent Aircycle 4.1 MVHR unit that will serve the 3-bed Duplex apartment when operating in both 'boost' mode and 'purge' mode.

Duty	System	Sound Power Level (dB(A)) at Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
37 l/s at 536 Pa, Part F Boost Mode	Open Outlet (supply)	23.6	37.7	45.4	46.5	45.0	40.6	31.9
	Open Inlet (extract)	16.8	33.0	39.8	39.4	38.2	32.1	23.9
	Breakout	16.4	37.0	42.3	42.7	36.9	31.9	23.2
43 l/s at 500 Pa, Purge Mode	Open Outlet (supply)	24.8	40.3	47.3	48.7	46.7	43.1	34.6
	Open Inlet (extract)	17.2	35.3	41.1	41.4	40.1	34.2	26.4
	Breakout	18.2	36.6	44.6	44.2	39.1	34.5	26.1

Table 6: A-weighted Sound Power Levels of Brookvent Aircycle 3.1 MVHR Unit for 2-bed Duplex apartment

In order to provide purge ventilation, some of the 1-bed apartments facing onto the enclosed corridor at the courtyard elevation of the podium building are provided with an additional extract fan. The extract fan is a TD-Mixvent TD-350/12 manufactured by S&P Ventilation Group.

Noise level data for the proposed TD-Mixvent purge fan units have been forwarded by AV Unibrak for the proposed flow rates and working pressures.

Table 7 identifies the reported sound power levels generated by the proposed TD-350/12 purge fan units that will serve the podium 1-bed apartment when operating at their design duty.

Duty	System	Sound Power Level (dB(A)) at Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
25 l/s at 55.8 Pa, Purge Mode	Open Outlet (supply)	22	29	45	51	50	48	39
	Open Inlet (extract)	21	29	43	50	51	49	41
	Breakout	13	21	42	40	45	44	31

Table 7: Sound Power Levels of TD-Mixvent (TD-350/12) purge fan unit for podium 1-bed apartments

It should be noted the sound power levels given in Tables 3 to 7 are 'open inlet' and 'open outlet' sound power levels, rather than 'in-duct' sound power levels.

In order to determine the 'in-duct' sound power levels due to the proposed Brookvent MVHRs, the values given in Table 8 must be added to the open inlet and open outlet sound power levels identified in Tables 3 to 7.

	Addition to open-inlet Sound Power Level (dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Correction to open inlet and open outlet to obtain in-duct sound power levels	23	17	11	6	2	1	0

Table 8: Addition to open-inlet and open outlet sound power levels to obtain in-duct sound power

CALCULATED NOISE LEVELS

The expected noise levels within apartment rooms given the reported in-duct sound power levels of the MVHR units and purge fan have been calculated. The calculations take into account room dimensions, acoustic losses due to end reflection at the air valve and other minor system losses. It should be noted that self-noise due to airflow through the air valve is not included in this assessment (see below).

The calculated noise levels assume that standard plastic ductwork is used to connect the MHVR inlets and outlets to the air valves within each room.

The calculations are based on the ductwork layouts detailed in the following drawings:

Podium

- 1-bed apartments: Z2-AVU-G525-PL-XX-1B01 - Podium - Apartment Type 1B1P Type 1_Ver2
- 2-bed Duplex apartments: Z2-AVU-G525-PL-XX-2B14- Podium -Apartment Type 2B4P Duplex Type 1_Ver2

Tower

- 1-bed apartments: Z1-AVU-G525-PI-XX-1B03 - Tower - Apartment Type 1B2P Type 1_Ver2
- 2-bed apartments Z1-AVU-G525-PI-XX-2B01 - Tower - Apartment Types 2B4P Type 1_Ver2
- 3-bed apartments: Z1-AVU-G525-PI-XX-3B01 - Tower - Apartment Type 3B6P Type 1_Ver1

Table 9 identifies the minimum recommended insertion loss of MVHR ductwork attenuation to allow the achievement of the required noise levels in the rooms of the podium 1-bed apartments.

Room	Minimum Recommended Dynamic Insertion Loss (dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
MVHR (Supply)	-	-	3	11	10	10	-
MVHR (Extract)	-	2	16	20	28	25	10

Table 9: Minimum recommended dynamic insertion loss of in-line attenuation for MVHR, podium 1-Bed apartments with Aircycle 1.2 – Part F Boost mode

Table 10 identifies the minimum recommended insertion loss of purge fan ductwork attenuation to allow the achievement of the required noise levels in the rooms of podium 1-bed apartments.

Room	Minimum Recommended Dynamic Insertion Loss (dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Purge fan	-	-	7	16	20	20	20

Table 10: Minimum recommended dynamic insertion loss of in-line attenuation for 1-bed podium apartment purge fan

Table 11 identifies the minimum recommended insertion loss of MVHR ductwork attenuation to allow the achievement of the required noise levels in the rooms of the tower 1-bed apartments.

Room	Minimum Recommended Dynamic Insertion Loss (dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
MVHR (supply)	-	-	3	11	10	10	-
MVHR (extract)	-	3	16	20	32	15	10

Table 11: Minimum recommended dynamic insertion loss of in-line attenuation for MVHR, Tower 1-Bed apartments with Aircycle 1.2

Table 12 identifies the minimum recommended insertion loss of MVHR ductwork attenuation to allow the achievement of the required noise levels in the rooms of the 2-bed apartments.

Room	Minimum Recommended Dynamic Insertion Loss (dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
MVHR (supply)	-	-	2	6	8	5	-
MVHR (extract)	-	-	14	15	20	20	10

Table 12: Minimum recommended dynamic insertion loss of in-line attenuation for MVHR, 2-Bed apartments with Aircycle 1.2

Table 13 identifies the minimum recommended insertion loss of MVHR ductwork attenuation to allow the achievement of the required noise levels in the rooms of the 3-bed apartments.

Room	Minimum Recommended Dynamic Insertion Loss (dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
MVHR (supply)	-	-	11	12	14	15	5
MVHR (extract)	-	-	2	6	10	-	-

Table 13: Minimum recommended dynamic insertion loss of in-line attenuation for MVHR, Tower 3-Bed apartments with Aircycle 4.1 MVHR unit

Table 14 identifies the minimum recommended insertion loss of MVHR ductwork attenuation to allow the achievement of the required noise levels in the rooms of the 2 bed duplex apartments.

Room	Minimum Recommended Dynamic Insertion Loss (dB) at Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
MVHR (supply)	0	6	16	16	20	20	10
MVHR (extract)	0	0	2	5	8	8	6

Table 14: Minimum recommended dynamic insertion loss of in-line attenuation for MVHR, Tower 2-Bed Duplex apartments with Aircycle 3.1

If acoustic flexible ductwork is used to achieve the recommended minimum insertion losses, whether in whole or in part, care must be taken to follow the manufacturer's installation instructions for flexible ductwork to minimise turbulent airflow within the duct and the generation of airflow-related noise.

MVHR Installation

To avoid noise radiation from lightweight walls, it is recommended that the MVHRs are not fixed to plasterboard walls or ceilings. Direct contact between plasterboard walls and ceilings and the MVHR units and ductwork must be avoided.

If MVHRs must be supported off plasterboard walls or ceilings, a proprietary vibration isolation fixing must be employed such that direct contact between the MVHRs and walls and ceilings is avoided. The performance of the isolation fixing must be such that compliance with the noise targets in Table 1 is achieved.

Utility Cupboard doors and walls

It should be noted that due to the noise breakout from the MVHR units when running in overheating purge mode during the day, in order to achieve an acceptable temporary noise level of 40dB LAeq in the living rooms, the door to each utility cupboard within apartments must achieve a weighted sound reduction index of 30 dB Rw.

The recommended minimum weighted sound reduction index of walls around the MVHR utility cupboards is 40 dB Rw. These walls must be boarded full-height to the structural soffit.

SELF-NOISE OF AIR VALVES

As with all ventilation systems, noise can be generated by airflow through the air valves within each room.

On the understanding that air extract and supply valves of diameter 150 mm are to be installed, it is recommended that the valve setting is no less than the values given in Table 15 in order to avoid undue noise generation at the air valve.

Table 15 gives the valve setting positions on the basis of Flaktwoods KE supply grilles and KK extract grilles. However, the recommended settings are also expected to be applicable to alternative proprietary air valves of the same diameter.

Apartment	Valve Position (mm, reference to neutral position)
1-Bed	-4
2-Bed	-5
2-Bed Duplex	-5
3-bed	-5

Table 15: Minimum recommended valve position settings

When commissioning each MVHR unit, control of the airflow to the apartment should be made principally at the MVHR unit rather than relying on closing the air valves down to less than the settings given in Table 15.

EXTERNAL NOISE INGRESS VIA MHVR DUCTWORK

The expected noise levels within apartment rooms due to external noise break-in via the intake and exhaust louvres of the MVHR ductwork system has been calculated. The calculations take into account acoustic losses due to end reflection at the air valve, due to losses at the MVHR heat exchanger, other minor system losses other system losses and the recommended insertion losses given in Tables 9 to 14.

It has been determined that no attenuators are required within the fresh air intake or exhaust ducts to achieve the recommended internal noise levels due to external noise ingress.

CONCLUSION

Calculations have shown that compliance with the project's acoustic requirements can be achieved within bedrooms, living rooms, kitchens and bathrooms given the provision proprietary attenuators within certain duct runs of the Port Street apartments.

It is important that best practice is followed in relation to the installation of ductwork and of any flexible acoustic ductwork to the MVHR systems to minimise the generation of noise due to turbulent airflow. The selection and setting of the room air valves, as discussed above, will also be critical in determining the final room noise levels.

I hope that the above is helpful, but if there are any aspects that you would like to discuss, please do not hesitate to contact the undersigned.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'Matt Fisher', with a stylized flourish at the end.

MATT FISHER BEng(Hons) CEng MIOA
For and on behalf of Fisher Acoustics Limited