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Project: Barclay House, Manchester

Subject: Acoustics and Ventilation
Coordination Review

To: Mr Ka Fan
Power Living (Barclay House) Ltd.

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Barclay House, Manchester – Acoustics and Ventilation Coordination Review

1. Summary

- 1.1 Apex Acoustics has been commissioned to review the façade sound insulation requirements suggested by Martec Environmental Consultants Ltd. and propose a lower performance requirement if feasible, for the proposed change of use of office spaces to residential apartments at Barclay House, 53 Whitworth Street West, Manchester M1 5NG.
- 1.2 Previous calculations had included 2 no. Greenwoods MA3051 trickle vents, with a sound insulation performance of 55 $D_{n,e,w}$ per apartment on the front (south) façade.
- 1.3 The proposed glazing specification for the building is understood to be 8.8/14/6.
- 1.4 The free-field noise levels incident on the front facade of the building have been obtained from the Environmental Noise Assessment undertaken by Martec. The data used in the reviewed calculations is detailed in section 2.
- 1.5 **One trickle vent** per apartment with a minimum sound insulation performance of **38 dB $D_{n,e,w}$** (eg: **RW Simon Acoustic EHAS**) has been calculated to achieve the target internal noise levels in all residential apartments on the front façade. The sound insulation performance of the proposed vent in each octave band is shown in Table 1. The glazing performance used in the calculations are shown in Table 3.

Trickle vent	Octave band centre frequency, Hz Element normalised level difference, D _{n,e} dB					D _{n,e,w} dB
	125	250	500	1k	2k	
RW Simon Acoustic EHAS	40	36	34	35	44	38

Table 1: Sound insulation performance of the proposed vent

- 1.6 Vents with an equivalent or higher sound insulation dB $D_{n,e}$ performance in each octave band than those shown above shall result in equal or better performance, respectively.

- 1.7 There are inconsistencies in the reported measured octave band noise levels on the rear (north) façade, and hence we are unable to comment on the vent performance required for the façade. Considering the location of the building, the rear façade is unlikely to have noise levels higher than the front façade and hence the vent proposed for the front façade is likely to achieve the target internal noise levels in the apartments on the rear façade as well.
- 1.8 The proposed plenum box, in which it is understood the attenuated trickle vent is to be mounted, can be constructed / lined with either of the following options to control the noise break-in into the apartments:
- Two layers of 12.5 mm plasterboard, each with a surface density not less than 8 kg/m²; or
 - A 12 mm cement particle board with a surface density not less than 15 kg/m².

2. Review of façade sound insulation requirements

- 2.1 The measured façade noise levels reported in the *ProPG - Environmental Noise Assessment*, Reference 1, have been used to obtain the A-weighted free-field day and night L_{Aeq} levels at the front façade of the building, as shown in Table 2.
- 2.2 The L_{AFmax} levels have been taken from the *Glazing and Ventilation Specification* report prepared by Martec, Reference 2. The tenth highest measured L_{AFmax} level during night-time has been reported as the maximum level.

Parameter	dB(A)	Octave band centre frequency, Hz A-weighted free-field noise levels, dB(A)				
		125	250	500	1k	2k
$L_{Aeq,16hr}$	65	47	54	58	62	58
$L_{Aeq,8hr}$	64	44	51	56	61	57
L_{AFmax}	76	58	65	69	73	71

Table 2: Calculated free field noise levels at the front façade of the building

- 2.3 The same apartment samples used in internal noise levels predictions by Martec have been reviewed. The same room and window dimensions, and reverberation times reported have been used.
- 2.4 The proposed glazing is understood to be 8.8/14/6 and the glazing performance shown in Table 3 has been used in the calculation to determine the minimum vent performance.

Glazing	Octave band centre frequency, Hz Sound Reduction Index, R dB					R_w dB
	125	250	500	1k	2k	
Pilkington Optiphon 8.8/16/6	25	27	38	48	47	41

Table 3: Sound reduction index of the proposed glazing used in the calculations

- 2.5 There were inconsistencies noted with the measured octave band façade L_{Aeq} levels on the rear façade, hence façade sound insulation calculations could not be undertaken for the rear façade.
- 2.6 The calculated internal noise levels are shown in Table 4.
- 2.7 Example calculations for the most noise exposed apartment, F3, are provided in Appendix A.
- 2.8 The calculation method for façade sound insulation is in accordance with BS 8233, Reference 3 and the principles of BS EN 12354-3, Reference 4.

- 2.9 From ISO 16283, Reference 5, the reverberation time is typically 0.5 seconds across the relevant frequency range for a furnished living room. This value is used for living rooms, bedrooms and studios.
- 2.10 Details of the methodology used to calculate internal noise levels are provided on our website: <https://www.apexacoustics.co.uk/calculation-facade-sound-insulation/>.

Unit / Room	Daytime dB L _{Aeq,16 hr}	Night-time	
		dB L _{Aeq,8hr}	dB L _{AFmax}
F3 Living	32	-	-
F3 Bedroom	32	30	43
F4 Studio	29	27	39
F5 Studio	29	27	40
F10 Studio	30	28	41
F11 Studio	31	28	41
G5 Studio	29	27	40

Table 4: Calculated internal noise levels

3. References

1. *ProPG Environmental Noise Assessment – Barclay House*, Martec Environmental Consultants Ltd., 2017.
2. *Glazing and Ventilation Specification – Barclay House*, Martec Environmental Consultants Ltd., 2018.
3. BS 8233:2014, Guidance on sound insulation and noise reduction for buildings
4. BS EN 12354-3:2000, Building Acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 3: Airborne sound insulation against outdoor sound.
5. BS EN ISO 16283-1:2014 Acoustics - Field measurement of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation.

Appendix A Example façade sound insulation calculations

F3 Living	
Volume, V / m^3	56
Window area, S / m^2	9
Reverberation Time, T / s	0.5
Number of vents feasible	1

Daytime $L_{Aeq, 16 \text{ hr}}$ (dB)	dB(A)	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz
External free-field noise, L_{1in}	65	47	54	58	62	58
Glazing: Optiphon 8.8/16/6 mm, R		25	27	38	48	47
Equation 1, $L_2(a)$	29	22	27	20	14	11
Vent: RW Simon Acoustic EHAS, $D_{n,e}$		40	36	34	35	44
Equation 2, $L_2(b)$	30	7	18	25	27	15
Total noise through all elements, L_2	32					

F3 Bedroom	
Volume, V / m^3	37
Window area, S / m^2	11
Reverberation Time, T / s	0.3
Number of vents feasible	1

Daytime $L_{Aeq, 16 \text{ hr}}$ (dB)	dB(A)	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz
External free-field noise, L_{1in}	65	47	54	58	62	58
Glazing: Optiphon 8.8/16/6 mm, R		25	27	38	48	47
Equation 1, $L_2(a)$	29	22	27	20	14	11
Vent: RW Simon Acoustic EHAS, $D_{n,e}$		40	36	34	35	44
Equation 2, $L_2(b)$	29	7	18	24	27	14
Total noise through all elements, L_2	32					

Night-time $L_{Aeq, 8 \text{ hr}}$ (dB)	dB(A)	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz
External free-field noise, L_{1in}	64	44	51	56	61	57
Glazing: Optiphon 8.8/16/6 mm, R		25	27	38	48	47
Equation 1, $L_2(a)$	27	19	24	18	13	10
Vent: RW Simon Acoustic EHAS, $D_{n,e}$		40	36	34	35	44
Equation 2, $L_2(b)$	28	4	15	22	26	13
Total noise through all elements, L_2	30					

Night-time L_{AFmax} (dB)	dB(A)	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz
External free-field noise, L_{1in}	76	58	65	69	73	71
Glazing: Optiphon 8.8/16/6 mm, R		25	27	38	48	47
Equation 1, $L_2(a)$	40	33	38	31	25	24
Vent: R_W Simon Acoustic EHAS, $D_{n,e}$		40	36	34	35	44
Equation 2, $L_2(b)$	40	18	29	35	37	27
Total noise through all elements, L_2	43					