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PROJECT TECHNICAL MEMORANDUM

JOB TITLE : Lomax + Ducie Street

REF : HT: 29666/PTM1

DATE : 10 August 2022

FROM : Tom Bonnert

ISSUED TO : Design Team

RE: LOMAX + DUCIE STREET, MANCHESTER PLANNING CONDITION 12 (ACOUSTIC NOTE)

1.0 Planning Condition 12

This memorandum outlines the project's scheme for acoustically insulating the residential accommodation against external noise in accordance with Planning Condition 12, which states:

"Before any above ground works commence a scheme for acoustically insulating and mechanically ventilating the residential accommodation against noise from adjacent roads shall be submitted to and approved in writing by the City Council as local planning authority. The approved noise insulation scheme shall be completed before any of the dwelling units are occupied. Prior to occupation a post completion report to verify that all of the recommended mitigation measures have been installed in the residential accommodation shall be submitted and agreed in writing by the City Council as local planning authority and any non compliance suitably mitigated in accordance with an agreed scheme prior to occupation."

1.1 Proposed Acoustic Criteria

With consideration toward the wording of Planning Condition 12, the following table outlines the proposed noise intrusion limits to be achieved within residential areas.

Area	Location	Daytime (07:00-23:00)	Night time (23:00-07:00)
Residential	Living Room	35 dB LAeq,16hr	-
	Bedroom	35 dB LAeq,16hr	30 dB LAeq,8hr 45 dB* LAmax
Common Part	Corridor/Entrance	NR 40 LAeq,16hr	

* not to be exceeded by more than 15 times per night-time period

Sponsor Member of The Institute of Acoustics; Members of UKELA & IEMA, The Association of Noise Consultants,
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Noise and vibration from mechanical services plant shall be controlled in-line with the following limits, which again, are considered to be commensurate with the wording of Planning Condition 12.

Area	MEP Noise to Internal Areas		
	A/C or ventilation systems serving actual area	All other systems within area	All other systems
Bedroom	Trickle (background) Day NR30 Trickle (background) Night NR25	NR20	NR15
	Boost NR35		
Living Room/Kitchen	Normal NR30	NR25	NR20
	Boost NR40 (Cooker hood: Low-High NR45-55)		
Bathrooms/En-suites	Normal NR40	NR30	NR25

2.0 Prevailing Noise Climate

A detailed environmental noise survey of the site has been undertaken by Hann Tucker Associates as part of the planning application for the site. The methodology and results are presented in our Report referenced “25369/NIA1”.

During both daytime and night-time weekday and weekend periods the dominant noise source was noted to be external fixed plant items serving the adjacent industrial unit (Presbar Diecastings). Noise from road traffic on the A665 was noted to elevate ambient noise levels during rush hour periods, although noise from pedestrians walking to and from a football match at the Etihad Stadium did not appear to have a noticeable effect on overall noise levels.

Maximum ($L_{A_{fmax}}$) noise levels were generally noted to be caused by cars passing the site at speed along Ducie Street, for both weekday and weekend night-time periods.

3.0 External Noise Intrusion Assessment

3.1 Overview

An assessment has been carried out in accordance with BS 8233's rigorous calculation method (as per below equation) to determine the sound reduction performance requirements of residential facades.

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{-\frac{D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{-\frac{R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{-\frac{R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{-\frac{R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$



The assessment considers the habitable room layouts and façade dimensions of the latest architectural drawings at the time of writing.

3.2 Design Proposals

Our assessment of external noise intrusion considers noise limits set out in Section 1.1, and the following principles for façade design to apartments:

Roof: Concrete slab on steel frame.

External walls: Brick slip or rain screen cladding on an insulated cavity fixed with SFS, with external CP board and two layers of plasterboard lining.

Windows: Punched in windows.

Ventilation: MVHR throughout.

3.3 Specifications and Guidance

3.3.1 Windows

The following specification for glazing details our recommended minimum octave band sound reduction indices. In all cases, it is essential that the system is tested in accordance with BS EN ISO 10140-2 and that the quoted minimum sound reduction specifications are met by the system as a whole (i.e. the complete assembly – i.e. the frame, glass, spandrel panels, seals, etc. – and not just the glass).

Where openable louvres are used for purge ventilation, they should provide a sound reduction performance at least equal to that required of the glass for the zone in which they are located, when in the closed position.

Type		Example Configuration (glass / airspace / glass)	Minimum Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)						Overall (dB) $R_w + C_{tr}$ (Guidance only)
			125	250	500	1k	2k	4k	
A	Orange	10 / 16 / 6.4 mm	28	31	34	38	39	39	35
B	Green	10 / 16 / 6 mm	22	25	30	32	34	34	30

The following sketches illustrate the extent of the above glazing zones.



Plan showing sound insulation performance zones for facades

3.3.2 External Walls

The external walls will comprise brick slip or rain screen cladding on an insulated cavity fixed with SFS, with external CP board and two layers of plasterboard linings. This system should be sufficient to satisfy the acoustic requirements provided the SFS is at least 100mm thick, fully filled with mineral wool insulation (10-45 kg/m³). The internal plasterboard linings shall be 2no. layers of 12.5 mm sound rated plasterboard (minimum overall mass of 20 kg/m²).

The above is expected to provide sufficient control of noise ingress providing walls are built to a good and airtight standard.

3.3.3 Roof

The acoustic requirements to adequately control noise ingress through the roofs is not considered to be onerous. With the provision of a concrete roof build-up, and plasterboard ceilings, suitable internal noise levels would be expected to be achieved.



3.3.4 Doors

Where external doors are proposed, they should provide a sound reduction performance at least equal to that required of the glass (see Section 3.3.1) to maintain the acoustic integrity of the building envelope.

3.3.5 MVHR Openings

The following table demonstrates the worst-case noise intrusion via the façade openings for MVHR inlet/outlet in a typical apartment in the orange glazing zone.

Daytime $L_{Aeq,16hr}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,T}$	66	63	62	63	59	51	66 $L_{Aeq,16hr}$
SWL into duct	42	39	38	39	35	27	-
SWL Breakout of duct in room	25	20	19	20	16	3	-
Ceiling Loss	-9	-12	-17	-20	-20	-20	-
Internal noise level, $L_{eq,T}$	21	13	7	5	1	0	12 dB $L_{Aeq,16hr}$

Night-time $L_{Aeq,8hr}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,T}$	63	60	59	60	56	48	63 $L_{Aeq,16hr}$
SWL into duct	39	36	35	36	32	24	-
SWL Breakout of duct in room	22	17	16	17	13	0	-
Ceiling Loss	-9	-12	-17	-20	-20	-20	-
Internal noise level, $L_{eq,T}$	18	10	4	2	0	0	9 dB $L_{Aeq,16hr}$

It can be seen from the above calculations that the predicted internal noise level through the worst-case MVHR inlets/outlets is predicted to be well below (~20dB) the corresponding internal noise criteria. As such, this transmission path is considered to be negligible in terms of noise contribution to the internal noise level.

3.4 Summary of Noise Intrusion Calculations

The tables below summarise the worst case incident noise level (i.e. highest) in each façade zone and the resultant internal noise levels for the worst case apartment (i.e. largest façade/glazing area to room volume ratio) in each glazing zone.

**Orange Glazing Zone**

Description	Daytime $L_{Aeq,16hr}$	Night-time $L_{Aeq,8hr}$	Night-time $L_{A_f,max}$
External Incident Noise Level	66 dB	63 dB	79 dB
Resultant Internal Noise Level	33 dB	29 dB	45 dB

Green Glazing Zone

Description	Daytime $L_{Aeq,16hr}$	Night-time $L_{Aeq,8hr}$	Night-time $L_{A_f,max}$
External Incident Noise Level	58 dB	58 dB	73 dB
Resultant Internal Noise Level	30 dB	30 dB	45 dB

Section 3.4.1 and 3.4.2 in-turn set out a summary of the calculation undertaken for the two respective façade zones.

3.4.1 Detailed Calculation (Orange Zone)**Daytime $L_{Aeq,16hr}$**

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, L_{eq}	69	67	63	62	58	50	66 $L_{Aeq,16hr}$
External wall, R_w	33	42	45	50	50	55	-
Glazing, R_w	28	31	34	38	39	39	ORANGE SPEC
Internal noise level, L_{eq}	42	37	30	25	20	12	33 dB $L_{Aeq,16hr}$

Night-time $L_{Aeq,8hr}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, L_{eq}	66	64	60	59	55	47	63 dB $L_{Aeq,8hr}$
External wall, R_w	33	42	45	50	50	55	-
Glazing, R_w	28	31	34	38	39	39	ORANGE SPEC
Internal noise level, L_{eq}	39	34	26	21	16	8	29 dB $L_{Aeq,16hr}$

Night-time $L_{A_f,max}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, L_{max}	82	80	76	75	71	63	79 dB $L_{A_f,max}$
External wall, R_w	33	42	45	50	50	55	-
Glazing, R_w	28	31	34	38	39	39	ORANGE SPEC
Internal noise level, L_{max}	55	50	42	37	32	24	45 dB $L_{Aeq,16hr}$



3.4.2 Detailed Calculation (Green Zone)

Daytime $L_{Aeq,16hr}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, L_{eq}	65	58	56	53	48	40	58 $L_{Aeq,16hr}$
External wall, R_w	33	42	45	50	50	55	-
Glazing, R_w	22	25	30	32	34	34	GREEN SPEC
Internal noise level, L_{eq}	43	33	25	21	14	5	30 dB $L_{Aeq,16hr}$

Night-time $L_{Aeq,8hr}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, L_{eq}	65	58	56	53	48	40	58 dB $L_{Aeq,8hr}$
External wall, R_w	33	42	45	50	50	55	-
Glazing, R_w	22	25	30	32	34	34	GREEN SPEC
Internal noise level, L_{eq}	43	33	25	21	14	5	30 dB $L_{Aeq,16hr}$

Night-time $L_{A_{fmax}}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, L_{max}	80	73	71	68	63	55	73 dB $L_{A_{fmax}}$
External wall, R_w	33	42	45	50	50	55	-
Glazing, R_w	22	25	30	32	34	34	GREEN SPEC
Internal noise level, L_{max}	58	48	40	36	29	20	45 dB $L_{Aeq,16hr}$

4.0 MVHR System Generated Noise

Noise generated by the operation of the MVHR will transmit into the ductwork and, before reaching the grille, will be radiate to some degree through the walls of the intermediate ductwork. This ductwork typically runs through ceiling voids and are thus separated from the habitable space by a layer of plasterboard which should mitigate any concerns of noise breakout through the ductwork.

Calculations of ductborne noise transfer into a typical living room and bedroom from the selected MVHR unit via supply and extract diffusers at normal operating duty have been undertaken. These are detailed calculations using an in-house programme which considers losses through the ductwork between the MVHR unit and diffuser.



The table below summarise the calculated internal noise level in a typical apartment based on background ventilation rates and boost ventilation rates.

Description	Living Room	Bedroom	Bathroom
Background ventilation	NR 21	NR 22	NR 16
Boost ventilation	NR 34	NR 34	NR 31

Section **Error! Reference source not found.** sets out a summary of the calculation undertaken for the bedroom (only bedroom presented in the interest of brevity as it is the worst case calculation), the respective ductwork losses, and the required attenuation specification.

It is important to note that the attenuator should be positioned as close to the MVHR unit as possible, prior to any ductwork splits, to ensure attenuation is afforded to all internal spaces served.

4.1.1 Detailed Calculation Summary (Bedroom MVHR)

Bedroom (Supply) – Background Ventilation

Desc.	Sound Level (dB) at Octave Band Centre Frequency (Hz)							Broadband
	63	125	250	500	1k	2k	4k	
Supply Sound Power Level (dB)	60	57	59	55	48	43	32	56 dBA
Ductwork Losses	-21	-16	-12	-7	-5	-6	-8	-
Attenuator Spec	-3	-4	-7	-14	-20	-20	-15	
Resultant Sound Level in Bedroom	18	23	30	26	17	12	5	NR 22

Bedroom (Supply) – Overheating Boost Ventilation

Desc.	Sound Level (dB) at Octave Band Centre Frequency (Hz)							Broadband
	63	125	250	500	1k	2k	4k	
Supply Sound Power Level (dB)	82	68	65	68	64	61	51	69 dBA
Ductwork Losses	-21	-16	-12	-7	-5	-6	-8	-
Attenuator Spec	-3	-4	-7	-14	-20	-20	-15	
Resultant Sound Level in Bedroom	41	35	36	38	33	31	24	NR 34



Yours sincerely



Tom Bonnert
for HANN TUCKER ASSOCIATES