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Planning Condition 9

Renold Building Plant Noise Impact Assessment

1.0 Planning Condition

Planning Permission for the scheme has been granted subject to conditions (ref 139124/FO/2024). Condition 9 pertains to noise from building services plant and states the following:

'... Condition 9

9)a) Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to the installation of the equipment hereby approved the scheme included the above and the locations on the roof shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site.

b) Within 1 month of the equipment hereby approved becoming operational, a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the works conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Reason - To safeguard the amenities of the occupiers of nearby accommodation, pursuant to saved policy DC26 of the Unitary Development Plan for the City of Manchester and policies SP1 and DM1 of the Core Strategy ...'

2.0 Relevant Standards and Guidance

2.1 BS 4142:2014+A1:2019: 'Method for Rating and Assessing Industrial and Commercial Sound'

BS 4142:2014+A1:2019 '*Method for rating and assessing industrial and commercial sound*' ("BS 4142") is intended to be used to assess noise of an industrial and commercial nature, which includes sound from fixed installations comprising mechanical and electrical plant and equipment.

The procedure contained in BS 4142: 2014+A1: 2019 for assessing environmental noise impact is to compare the measured or predicted noise level from the source in question, the "Specific Sound Level" immediately outside the noise sensitive premises, with the corresponding "Background Sound Level". Where the noise contains attention attracting characteristics such as tonal, impulsive, and/or intermittent elements, it may be appropriate to apply a correction to the Specific Sound Level to obtain the "Rating Level".

BS 4142: 2014+A1: 2019 states that the significance of sound arising from an industrial and/or commercial nature depends upon both the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, and also the context in which the sound occurs:

Typically, the greater this difference, the greater the magnitude of the impact.

A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

The lower the Rating Level is relative to the measured Background Sound Level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the Rating Level does not exceed the Background Sound Level, this is an indication of the specific sound source having a low impact, depending on the context.

For the daytime, the assessment is carried out over a one-hour period, and over a 15-minute period at night. The daytime and night-time periods are defined as occurring between 07:00 hours to 23:00 hours, and 23:00 hours to 07:00 hours, respectively.

3.0 Environmental Noise Survey Results

Table 1 provides a basic summary of the typical overall, A-weighted noise levels measured at the noise monitoring locations at the north and south facades of the Renold Building, in $L_{Aeq,T}$ and $L_{A90,15min}$ terms. The specific, measured noise levels pertinent to the required BS4142 environmental noise assessment are highlighted in ***bold, italic*** text:

Date	Measurement Position	Daytime (07:00 – 23:00 Hours)		Night Time (23:00 – 07:00 Hours)	
		dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)	dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)
Thursday 25 April 2024	North	56*	<i>50</i>	55	<i>45</i>
	South	60*	57	58	50
Friday 26 April 2024	North	61*	55	-	-
	South	62	59	-	-
* Measurement not conducted for the full assessment period					

Table 1: Summary of the typical overall, A-weighted noise levels as measured at Positions 1 & 2

4.0 Proposed External Plant Noise Limits

On the basis of the results of the noise survey and the requirements of Planning Condition 9, **Table** sets out the maximum permissible Rating Level to be achieved by the proposed M&E plant associates with the development at the nearest noise sensitive premises:

Location	Maximum Permissible Rating Level, dB $L_{A,Tf}$	
	Daytime (07:00-23:00hrs)	Night-time (23:00-07:00hrs)
Any noise sensitive façade	45	40

Table 2: Plant Rating Limits

The above noise level limits are specified as Rating Levels and as such it will be necessary to consider the acoustic character associated with any of the proposed M&E plant associated with the scheme when predicting the noise impact expected.

5.0 Proposed External Plant Items

Based on the current M&E information it is proposed to install the following items of external building services plant on either the second or eighth floor roof as set out in **Table 3** below.

Plant Item	Manufacturer	Model	Location
AHU01	AirSource	N/A	2 nd Floor Roof
AHU04	AirSource	N/A	2 nd Floor Roof
OU01	Mitsubishi	PURY-P350YNW-A	2 nd Floor Roof
OU02	Mitsubishi	PURY-P250YNW-A	2 nd Floor Roof
OU03	Mitsubishi	PURY-P850YSNW-A2	2 nd Floor Roof
OU04	Mitsubishi	PUZ-ZM250YKA2	2 nd Floor Roof
OU05	Mitsubishi	PUZ-ZM250YKA2	2 nd Floor Roof
OU06	Mitsubishi	PUZ-ZM250YKA2	2 nd Floor Roof
OU07	Mitsubishi	PUZ-ZM250YKA2	2 nd Floor Roof
OU08	Mitsubishi	PUZ-ZM125YDA	2 nd Floor Roof
OU12	Mitsubishi	PURY-P350YNW	8 th Floor Roof
OU13	Mitsubishi	PURY-P350YNW	8 th Floor Roof
OU14	Mitsubishi	PURY-P350YNW	8 th Floor Roof
OU15	Mitsubishi	PURY-P350YNW	8 th Floor Roof
OU16	Mitsubishi	PURY-P350YNW	8 th Floor Roof
OU17	Mitsubishi	PURY-P450YNW	8 th Floor Roof

Table 3: Proposed Plant Items

6.0 Proposed Plant Locations

It is proposed to locate the plant on either the second or eighth floor roof.

Figure 1 shows the proposed locations of the plant:

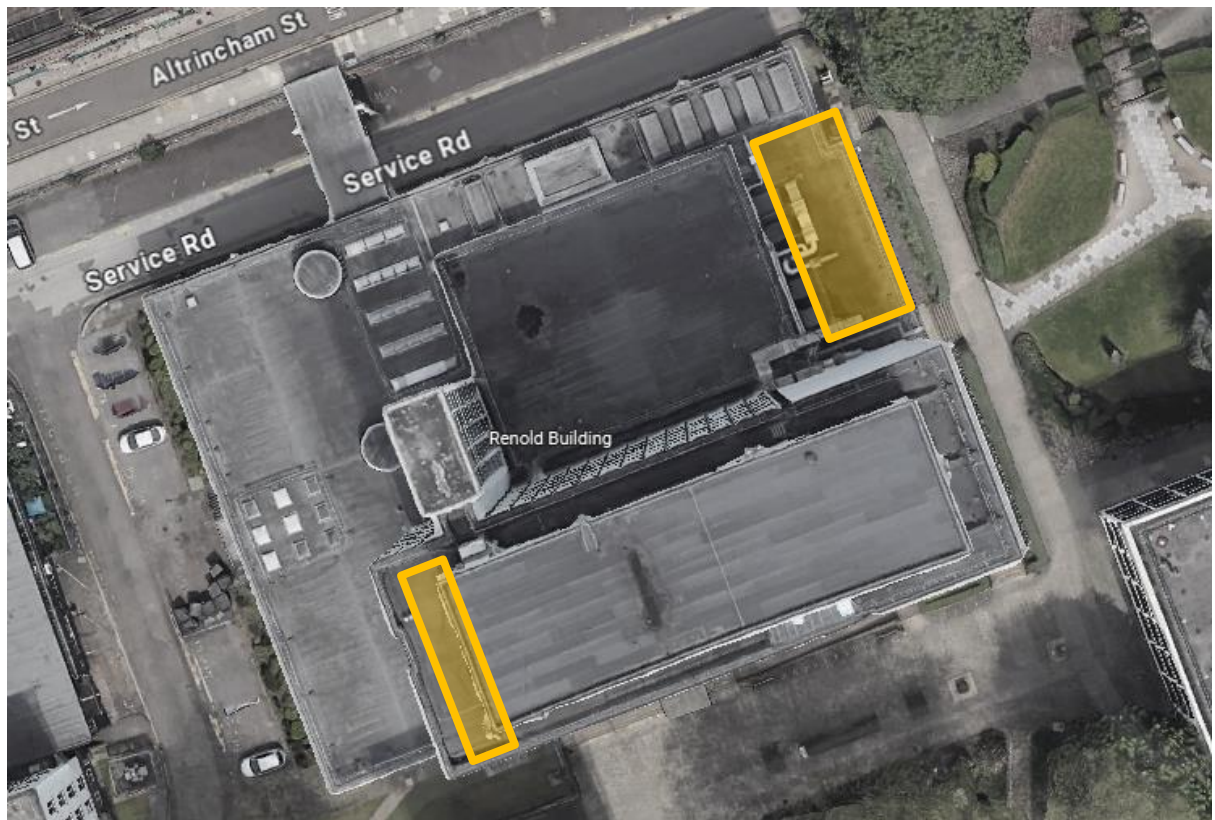


Figure 1: Plan Showing Proposed Plant Locations (maps.google.com)

7.0 External Plant Operational Hours

It is understood that the proposed plant will operate during daytime (07:00-23:00) hours only.

8.0 External Plant Noise Levels

Table 4 below sets out the manufacturers sound pressure levels at 1 metre from each of the new condenser units:

Manufacturer	Model	Sound Pressure Level @ 1m, dB per Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	dB(A)
Mitsubishi	PURY-P250YNW-A	53	52	42	42	35	32	38	44
Mitsubishi	PURY-P350YNW-A	55	55	51	47	43	37	36	49
Mitsubishi	PURY-P450YNW-A	65	57	52	50	48	44	40	53
Mitsubishi	PURY-P850YNW-A	68	60	55	52	50	47	42	55
Mitsubishi	PUZ-ZM250YKA2*	68	58	58	58	53	50	45	59
Mitsubishi	PUZ-ZM125YDA*	56	50	48	46	40	37	32	47
* includes a 3dB reduction for low-noise mode as advised as 2-6dB by Manufacturer									

Table 4: Condenser Noise Data

Table 5 below sets out the manufacturers in-duct sound power levels for each of the proposed AHU terminals:

AHU	Terminal	Sound Pressure Level @ 1m, dB per Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
01	Fresh Air	59	73	64	64	54	47	39	31
	Supply	65	78	72	71	70	64	58	51
	Extract	60	69	63	62	55	49	44	38
	Exhaust	65	77	70	72	72	69	64	61
04	Fresh Air	62	82	69	65	58	51	43	37
	Supply	72	85	76	76	73	67	61	53
	Extract	64	75	67	63	57	52	46	44
	Exhaust	65	75	54	53	51	46	40	24

Table 5: AHU Noise Data

Table 6 below sets out the proposed attenuators for the atmospheric terminals of the AHU units:

AHU	Terminal	Dynamic Insertion Loss, dB per Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
01	Fresh Air	6	11	21	27	28	22	20	18
	Supply	8	14	25	35	34	27	23	20
	Extract	8	14	25	35	34	27	23	20
	Exhaust	6	11	21	27	28	22	20	18
04	Fresh Air	5	11	19	25	24	19	18	16
	Supply	8	13	23	33	31	24	20	18
	Extract	8	13	23	33	31	24	20	18
	Exhaust	5	11	19	25	24	19	18	16

Table 6: AHU Attenuator Data

9.0 External Plant Noise Assessment

In order to predict the likely resultant plant noise levels at the identified noise sensitive receptors, a 3D computer based environmental noise model has been created using the proprietary DataKustik “CadnaA” Noise Mapping software. The following assumptions have been made in the generation of the noise model:

- The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: ‘Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation’;
- The model was set to include up to second-order reflected noise from solid structures;
- Ground absorption has been set to G=1 (soft ground) with the exception of large paved/tarmacked areas (G=0);
- Acoustic screening and reflections afforded by nearby buildings and solid structures.

The model predicts the resultant plant noise Specific Level at the noise sensitive receptors with all plant running simultaneously.

A visualisation of the noise model is presented in Figure 3 overleaf.

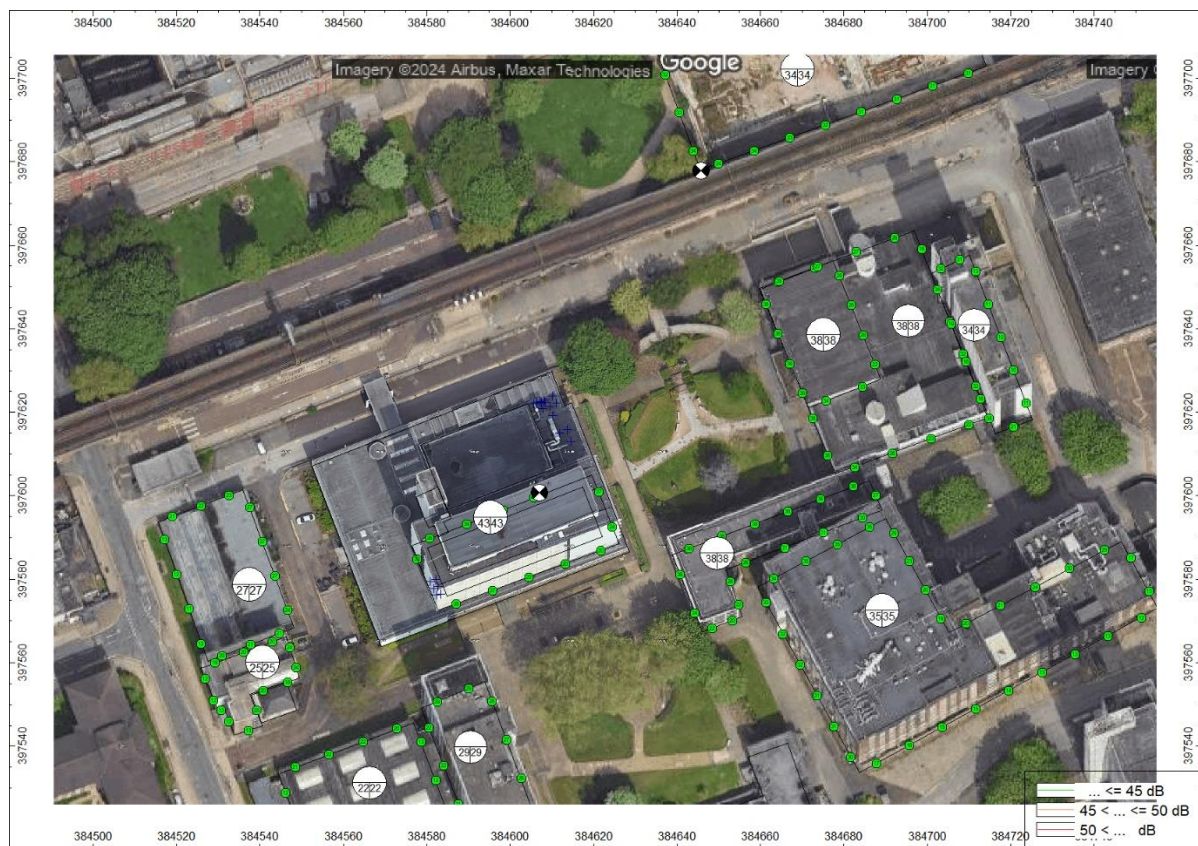


Figure 3: Visualisation of 3D plant noise model, Specific Sound level, dB, L_{Aeq}

9.1 BS 4142 Rating Penalty

As the condensers are fan-driven there is a probability that the noise generated have a “clearly perceptible” tone at the noise-sensitive receptors. Therefore, a +4dB rating penalty is deemed to be applicable in line with current BS 4142 guidance.

9.2 Context

In full accordance with BS 4142 methodology, the context in which the sound occurs must be taken into consideration when determining the magnitude of the noise impact. In this case, the background noise level at site is dominated by transportation noise and other noise sources typical of an urban location. As such, the context of the site is not expected to affect the BS 4142 predicted magnitude of the noise impact generated.

9.3 Summary

Table below summarises the results of the plant noise impact assessment:

Receptor	Specific Noise Level, dB, $L_{Aeq,T}$	Acoustic Character Correction, dB	Rating Level, dB, $L_{Ar,Tr}$	Maximum Permissible Rating Level, dB $L_{A,Tr}$	Exceedance, dB
Renold Building	43	+4	47	45	+2
Barnes Wallis Building	38	+4	42	45	-3
Proposed Student Resi	34	+4	38	45	-7

Table 7: Summary of Plant Noise Assessment

The above assessment indicates that there may be a slight exceedance of up to 2dB of the plant noise limit at the closest windows of the Renold Building itself, but the resultant noise level at all other nearby noise sensitive windows should not exceed the proposed plant noise limit set in line with the LPA guidance.

As stated above, a potential exceedance of the proposed plant noise limit at a small number of the Renold Building's own windows directly overlooking the lower rooftop plant space is predicted, which, in accordance with BS 4142 would be considered an initial indication of a minor adverse impact. However, this initial estimate must be modified by context. In this instance it is important to consider the context of the existing ambient noise climate and the existing natural ventilation strategy employed within the building.

Through the day-time ambient noise climate as measured in the vicinity of the north facing façade of the Renold Building was measured to be ca. 56-61dB $L_{Aeq,16hr}$, 9-14dB above the predicted Rating Level $L_{Ar,Tr}$ and 13-18dB higher than the predicted worst case specific noise level $L_{Aeq,T}$. Through a partially open window, allowing for approximately 15dB attenuation, the predicted rating level would be approximately 32dB $L_{Ar,Tr}$, with general ambient noise through the window ca. 41-46dB $L_{Aeq,16h}$. It is therefore likely that in practice the noise from the 2nd floor roof plant installation will likely be close to inaudible below the ambient noise level with windows open for ventilation, and is therefore unlikely to be considered a noise nuisance, especially by the building's own operators.

It should furthermore be noted that the 1-2dB exceedance predicted is based on the pessimistic assumption of a 4dB penalty for tonality, and only a 3dB reduction in noise for low-noise mode which the Manufacturer has stated could be up to 6dB in practice.

Based on the above contextual review and summary of conservative assumptions it is therefore concluded that the minor exceedance of 1-2dB at the worst affected windows of the development itself is unlikely to give rise to a noise nuisance, and the predicted rating level at all other receptors is below the LPA derived criteria, therefore Condition 9a can be discharged.

Yours sincerely
For and on behalf of Sol Acoustics Limited

A handwritten signature in dark ink, appearing to read "Joe Sinker", with a long horizontal stroke extending to the right.

Joe Sinker MIOA
Executive Consultant

APPENDIX A

GLOSSARY OF ACOUSTIC TERMS

Term	Abbreviation	Description
Decibel	dB	A scale for comparing the ratios of two quantities, including sound pressure and sound power.
A-weighting	dB(A)	The unit of sound level, weighted according to the A-scale, which considers the change in sensitivity of the human ear at varying frequencies.
Sound Pressure Level	L_{pA}	A measure of the sound pressure at a particular location. Typically expressed in dB(A) referenced to 2×10^{-5} Pascals.
Equivalent Continuous Sound Level	$L_{Aeq,T}$	The steady level of sound over a prescribed period of time which would contain the same total sound energy as the actual fluctuating noise under consideration in the same period of time.
Statistical Sound Levels	L_{A10} and L_{A90}	The level of noise exceeded for a percentage of the time period being sampled, namely 10% or 90% respectively.
Background Sound Level	$L_{A90,T}$	The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of the time period being sampled.
Maximum Sound Level	L_{Amax}	The maximum sound or noise level determined with instrumentation set to either a fast time weighting, L_{AFmax} , or a slow time weighting, L_{ASmax} , as occurring during the time period being sampled.
Sound Power Level	L_{WA}	A measure of the total sound energy radiated from a source. Like sound pressure levels, this is also expressed in dB(A) terms, but it is referenced to 1×10^{-12} W.
Broadband		Sound sampled over a wide range of frequencies.
Narrow band		Sound sampled over a specific, restricted frequency range. Used to ascertain the amplitude and significant of individual, audible tones, and to assist in identifying particular sources of noise within a complex, multi-source soundscape environment.
Ambient Sound	$L_{eq,T}$	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far.
Specific Sound Level	$L_{eq,T}$	The Equivalent Continuous A-Weighted Sound Level at an assessment position produced by a specific sound over a given reference time interval, T_r
Rating Level	L_{Ar,T_r}	The Specific Sound Level plus any adjustment for the acoustic characteristic features of the noise (e.g. intermittency, tones etc.).
Residual Noise	$L_{Aeq,T}$	The ambient sound remaining at given position in a given situation, when the specific sound source is suppressed to such an extent that it no longer contributes to the ambient sound.
Sound Reduction Index	SRI	The reduction in sound energy when transmitted through a panel or similar planar element, typically used in relation to single octave or one-third octave frequency band values.
Weighted Sound Reduction Index	R_w	The Sound Reduction Index expressed as a single figure, as expressed against a reference curve.
Dynamic Insertion Loss	DIL	Reduction in acoustic energy resulting from the insertion of a noise control element (e.g. an attenuator, acoustic enclosure etc.).
Free Field		Noise measuring location that is free from the presence of sound reflecting objects (except the ground), usually taken to mean being at least 3.5 metres distance from reflective surface(s) or greater.