

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Manchester Goods Yard, St Johns

Plant noise egress assessment report

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

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Version	Date	Comments	Author	Reviewer
A	1 July 22		Kane Mitchell	James Atha
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Summary

Sandy Brown has been appointed to carry out plant noise measurements at Manchester Goods Yard, St Johns, Manchester.

The report presents the results of the plant noise measurements undertaken and the subsequent assessment of plant noise egress.

The level of plant noise egress is predicted to be L_{Aeq} 48 dB at the nearest noise sensitive receptor.

The proposed items of plant will operate during the daytime (07:00-23:00) but will not operate during the night-time (23:00-07:00).

As such, the predicted level of plant noise egress, based on the measurements undertaken, complies with the plant noise egress limits set in line with the Manchester City Council criteria.

As such, planning condition 21 should be discharged.

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1 Introduction

Sandy Brown has been appointed to carry out plant noise measurements at Manchester Goods Yard, St Johns, Manchester.

The report presents the results of the plant noise measurements undertaken and the subsequent assessment of plant noise egress.

Appendix A presents the test equipment information.

2 Plant noise egress criteria

2.1 External noise criteria for Manchester City Council

Planning condition 21 imposed by Manchester City Council states the following:

‘Externally mounted ancillary plant, equipment and servicing shall be selected and / or acoustically treated in accordance with a scheme as relevant to each phase and designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.

The scheme shall be submitted to and approved in writing by the City Council as local planning authority prior to occupation of each phase in order to secure a reduction in the level of noise emanating from the site’

Based on this condition, the corresponding proposed limits are provided in Table 1.

Table 1 MCC plant noise limits

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, L_{Aeq} (dB)
Daytime (07:00 – 23:00)	48
Night-time (23:00 – 07:00)	42

2.2 Attention catching features

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), the plant should be designed to achieve a limit below those set out above, based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise, which is equally both impulsive and tonal, then both features can be taken into account by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment is not appropriate, then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

- 15 dB in the low frequency one-third octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency one-third octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency one-third octave bands (500 Hz to 10000 Hz).

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

3 Plant noise egress assessment

3.1 Plant layouts

The rooftop plant item locations are set out below:

- 3 x chillers (highlighted in blue within Figure 1)
- AHU-1 (highlighted in red within Figure 1)
- AHU-2 (highlighted in red within Figure 1)
- AHU-3 (highlighted in green within Figure 1)

- AHU-4 (highlighted in yellow within Figure 1)
- AHU-5 (highlighted in pink within Figure 1).

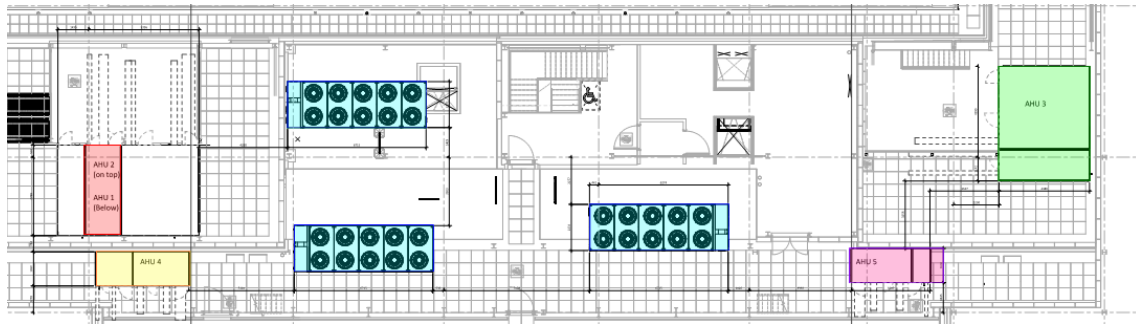


Figure 1 Rooftop plant layout

3.2 Plant noise data

The following section sets out the plant noise data for reference only. The plant noise egress assessment has been based on the noise measurements of the plant items operating in-situ.

3.2.1 Chiller noise data

The chillers achieve a sound pressure level of L_{Aeq} 55 dB at 1 m with the AA303S acoustic shroud proposed.

Octave band acoustic data was previously provided for the chiller with an alternative AA205LS/305LS acoustic shroud. This octave band data has been adjusted to equate to a sound pressure level of L_{Aeq} 55 dB at 1 m and is summarised in Table 2.

Table 2 Sound pressure data for chiller with acoustic shroud

	Sound pressure level at 1 m, L_{eq} (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Chiller with acoustic shroud	44	61	54	56	45	45	41	42

3.2.2 AHU noise data

The AHU in-duct sound power data is summarised in Table 3.

Table 3 AHU sound power data

	Sound power level, L_w (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
<u>AHU 1</u>								
Inlet	89	95	86	81	79	76	73	74
Exhaust	84	90	79	81	77	74	71	67
<u>AHU 2</u>								
Inlet	89	95	86	81	79	76	73	74
Exhaust	95	96	90	90	86	83	79	78
<u>AHU 3</u>								
Inlet	89	95	86	81	79	76	73	74
Exhaust	95	96	90	90	86	83	79	78
<u>AHU 4</u>								
Inlet	80	88	82	79	76	75	72	67
Exhaust	81	87	83	83	80	76	72	69
<u>AHU 5</u>								
Inlet	80	88	82	79	76	75	72	67
Exhaust	81	87	83	83	80	76	72	69

The AHU breakout noise data is summarised below:

- AHU 1 L_{Aeq} 52 dB at 5 meters
- AHU 2 L_{Aeq} 51 dB at 5 meters
- AHU 3 L_{Aeq} 53 dB at 5 meters
- AHU 4 L_{Aeq} 46 dB at 5 meters
- AHU 5 L_{Aeq} 48 dB at 5 meters

3.3 Attenuation and mitigation measures

3.3.1 Air handling unit mitigation

The in-duct AHU attenuator insertion losses are provided in Table 4.

Table 4 AHU attenuator insertion losses

Attenuator	Attenuator insertion loss (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
<u>AHU 1</u>								
Inlet	9	13	25	49	55	42	26	17
Exhaust	9	13	26	53	55	49	31	24
<u>AHU 2</u>								
Inlet	13	18	31	55	55	55	42	32
Exhaust	14	18	32	55	55	55	41	31
<u>AHU 3</u>								
Inlet	10	13	27	55	55	43	26	19
Exhaust	9	13	25	49	55	44	27	19
<u>AHU 4</u>								
Inlet	8	13	24	48	55	47	29	22
Exhaust	10	16	30	54	55	40	26	19
<u>AHU 5</u>								
Inlet	8	13	24	48	55	47	29	22
Exhaust	10	16	30	54	55	40	26	19

3.4 Screening

A screen is provided along the edge of the roof and behind the plant deck as shown in Figure 2. This screen is solid and equal to the height of the lift overrun.

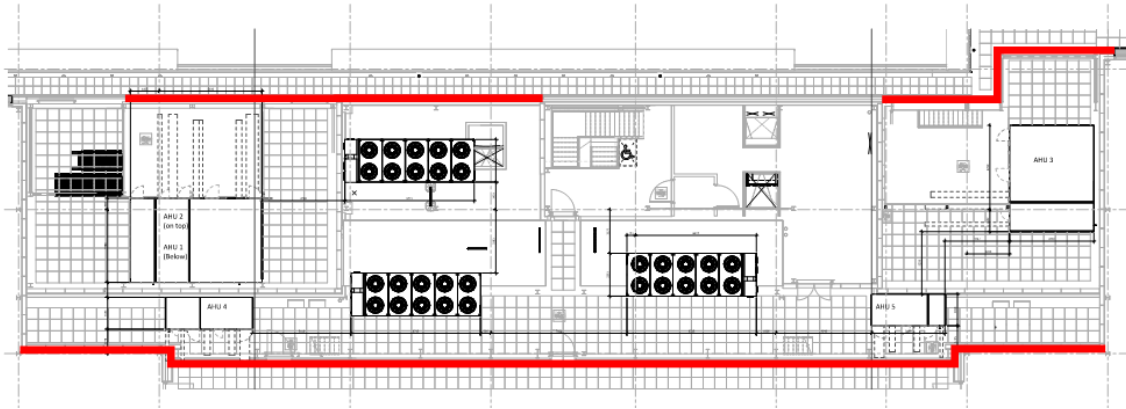


Figure 2 Screening extent

A photograph of the installed plant screen is provided in Figure 3. The exact specification of the plant screen is not known, however it is solid metal and expected to achieve a minimum weight of 11 kg/m^2 . This would be considered suitable from an acoustic perspective.



Figure 3 Photograph of installed plant screen

3.4.1 Operational hours

The plant will be in operation during the daytime (07:00-23:00) and will be switched off during the night-time (23:00-07:00).

3.5 Plant noise measurements

3.5.1 Method

Plant noise measurements were initially undertaken by Kane Mitchell on 9 June 2021.

During the initial plant noise measurements, AHU 04 and AHU 05 were not operating and it was not possible to access the AHU 03 intake / exhaust atmospheric terminations.

Further plant noise measurements were undertaken on 14 July 2022 with AHU 04 and AHU 05 operating, and access to the AHU 03 atmospheric terminations possible.

3.6 Equipment

The rooftop plant noise measurements were made using a BK 2250 sound level meter.

The sound level meter and microphone were calibrated at the beginning and end of measurements. No significant calibration deviation occurred. The calibration information for the equipment used during the measurements is provided in Appendix A.

3.6.1 Measurement results

The results of the plant noise measurements undertaken are provided in Table 5. These measurements were taken at a 1 m distance from the sources.

Table 5 Plant noise measurement results

Measurement ref.	Plant item / source	Measured noise level, L_{Aeq} 30 seconds (dB)
1	AHU 01 breakout	65
2	AHU 01 breakout	64
3	AHU 01 intake / exhaust	64
4	AHU 01 intake / exhaust	64
5	AHU 02 breakout	65
6	AHU 02 breakout	65
7	AHU 02 intake / exhaust	62
8	AHU 02 intake / exhaust	62
9	AHU 03 breakout	56

Measurement ref.	Plant item / source	Measured noise level, L_{Aeq} 30 seconds (dB)
10	AHU 03 breakout	56
11	AHU 03 intake / exhaust	57
12	AHU 03 intake / exhaust	57
13	AHU 04 breakout	50
14	AHU 04 breakout	51
15	AHU 04 intake / exhaust	48
16	AHU 04 intake / exhaust	47
17	AHU 05 breakout	49
18	AHU 05 breakout	49
19	AHU 05 intake / exhaust	53
20	AHU 05 intake / exhaust	52
21	Chiller 1 & 2	56
22	Chiller 1 & 2	57
23	Chiller 3	53
24	Chiller 3	53
25	AHU 03 breakout	59
26	AHU 03 breakout	59

3.7 Plant noise egress levels and assessment

The 3D plant noise egress model of the site has been updated based on the plant noise measurements undertaken. This model takes into account screening from surrounding buildings, reflections and distance attenuation.

A photograph of this model is provided in Figure 4.

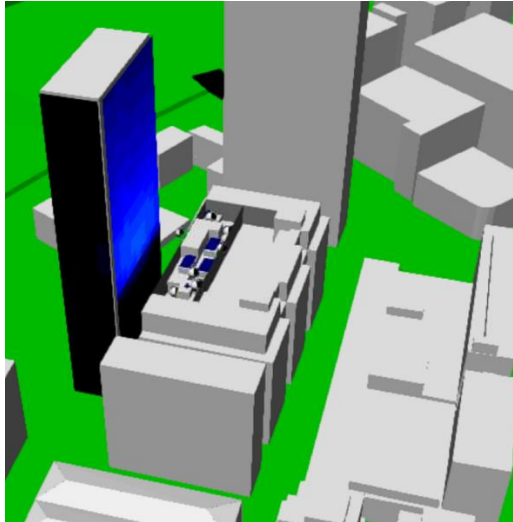


Figure 4 Screenshot of 3D acoustic model

The nearest and worst effected noise sensitive premise is considered to be the overlooking Nickle and Dime towers. The resulting levels of plant noise egress are calculated to not exceed L_{Aeq} 48 dB at the nearest overlooking tower.

The maximum predicted levels of plant noise egress at the surrounding noise sensitive premises are shown in the plan in Figure 5.

The predicted plant noise egress levels incident on the Nickle and Dime towers, which directly overlooks the plant area, are shown in Figure 6.

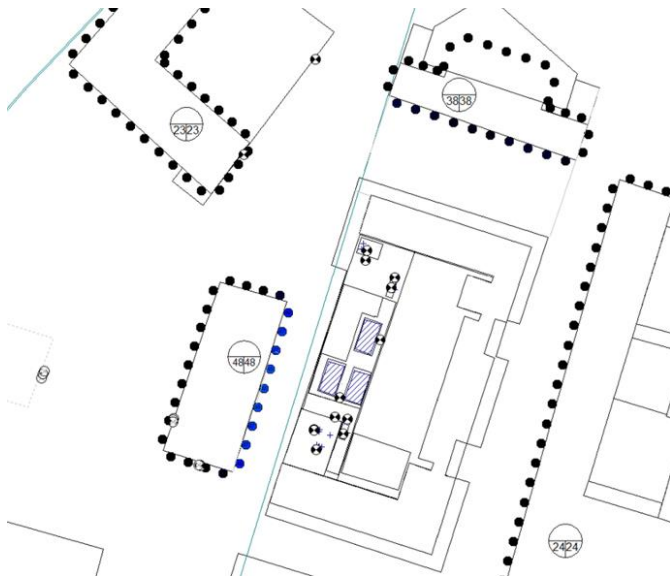


Figure 5 Predicted levels of plant noise egress - Plan

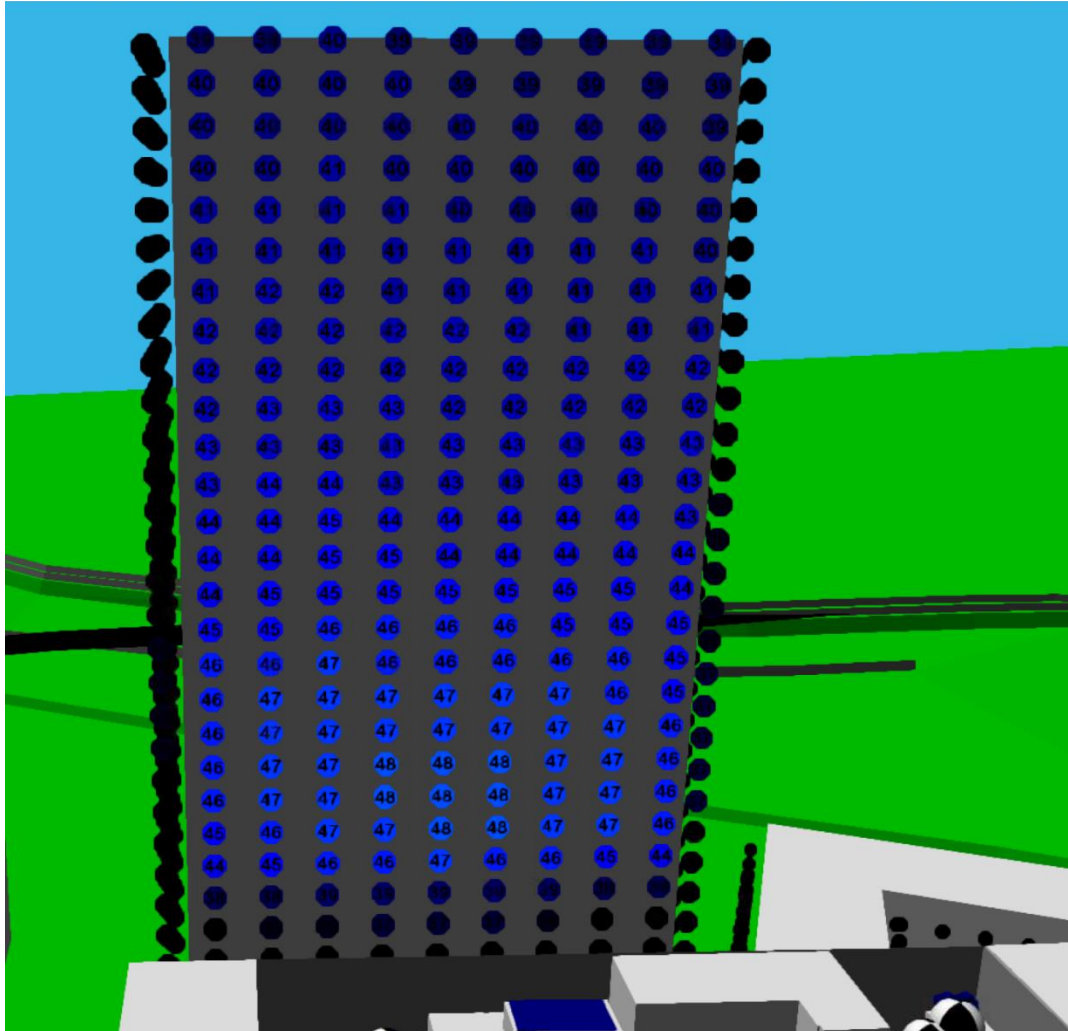


Figure 6 Predicted levels of plant noise egress – Nickle and Dime towers

Subjectively, no attention catching features were readily audible when undertaking measurements of the plant items. As such no corrections for attention catching features are deemed necessary.

3.7.1 Comparison to Manchester City Council criteria

The predicted noise egress levels based on the measurement also meet with the relevant daytime (07:00-23:00) Manchester City Council criteria as per Table 1. As the plant will not operate during the night-time, (23:00-07:00) the night-time plant noise egress criteria will also be achieved. As such, planning condition 21 should be discharged.

Appendix A

Test equipment information

Equipment

A BK 2250 sound level meter was used to undertake the the Pol 05 plant measures and the Hea 05 indoor ambient noise level measurements. The calibration details for the sound level meter are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	2250/3011964	Brüel & Kjær	4 Sep 21	UCRT19/1970, UTRC19/1976
Microphone	4189/3100176	Brüel & Kjær	4 Sep 21	UCRT19/1970, UTRC19/1976
Pre-amp	ZC0032/26376	Brüel & Kjær	4 Sep 21	UCRT19/1970, UTRC19/1976
Calibrator	4231/3019123	Brüel & Kjær	3 Sep 21	UCRT19/1969

Calibration of the sound level meter used for the tests is traceable to national standards. The calibration certificates for the sound level meter used in this survey are available upon request.

The sound level meter and microphone were calibrated at the beginning and end of the measurements using their respective sound level calibrator. No significant deviation in calibration occurred.