

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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ABC Manchester

Plant noise egress measurements and assessment

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

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Summary

Sandy Brown have been commissioned to carry out an installed plant noise egress assessment in order to discharge Planning Condition 10 for ABC, Manchester.

Noise measurements of the installed plant items have been carried out for the worst-case daytime mode. An assessment of plant noise egress to the nearby noise sensitive receivers have been carried out.

Further mitigation will be required to meet plant noise egress limits at the nearest noise sensitive premises, comprising solid backing to existing louvres.

The predicted plant noise level outside of the nearest noise sensitive receptors aside from

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1 Introduction

Sandy Brown have been commissioned to carry out an installed plant noise egress assessment in order to discharge Planning Condition 10 for ABC, Manchester.

Noise measurements of the installed plant items have been carried out for the worst-case daytime mode. An assessment of plant noise egress to the nearby noise sensitive receivers have been carried out in accordance with the plant noise limits as set out in Sandy Brown report 17561-R02-B *Acoustic planning report* dated 8 March 2018 to meet a planning condition set by Manchester City Council.

This report provides details of the noise survey, including measurement results, and the plant noise egress assessment.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 1



Figure 1 Aerial view of site location (courtesy of Google Earth Pro)

2.2 Adjacent premises

The nearest noise sensitive premises, as identified in Sandy Brown memo 17561-R060B *Plant noise egress report* dated 31 October 2018 are Rosetti Place (residential) to the West (highlighted in green in Figure 1), One Spinningfields (offices) to the North (highlighted in blue in Figure 1), and St John's Court (offices) to the east (highlighted in pink in Figure 1).

3 Assessment criteria

3.1 Planning conditions

The planning condition wording is set out below as received

Planning condition 8:

"The development shall be acoustically insulated in accordance with the Noise Assessment prepared by Sandy Brown dated 8 March 2018, Plant Noise Egress Assessment dated 31 October 2018 and Noise Breakout Assessment dated 31 October 2018, as approved on 28 October 2019."

Planning condition 10:

"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. The scheme 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. Notwithstanding the details in the Plant Noise Assessment dated 17 October 2019 prepared by RBA and Noise Assessment prepared by Sandy Brown dated 8 March 2018, a validation report is required for submission prior to occupation of the development for approval by the Local Planning Authority."

3.2 Plant noise egress criteria

The plant noise egress limits for the development have been taken from Sandy Brown report 17561-R02-B *Acoustic planning report* dated 8 March 2018. These have been reproduced in Table 1.

Table 1 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises ($L_{Aeq,15min}$ dB)
Daytime (07:00-23:00)	46
Night-time (23:00-07:00)	38

The limits set out in Table 1 do not include any attention catching features.

3.2.1 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.

4 Survey

4.1 Measurement method

Attended sample measurements were taken at various locations around ABC, Manchester.

These were taken at each external plant area, namely the area on the level 3 podium, the Astley rooftop plant area and the Byrom rooftop plant area, and for each individual type of equipment. The attended measurements were carried out on 11 August 2022. Dave Williams of AllPlus management was present during the measurements.

Details of the equipment used and the noise indices measured are provided in Appendix A.

4.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

The reported temperature during the survey was 30°C. Due to the high temperatures, the external cooling plant was likely running at maximum duty and is therefore likely to represent a worst-case.

4.3 Plant noise measurements

The results of the plant noise measurements are detailed in Table 2.

Table 2 Summary of plant noise measurements

Meas ref.	Plant item/Background noise level	Sound pressure level measured, $L_{Aeq,1\ min}$ (dB)	Notes
<i>Astley Roof plant deck</i>			
1	Mitsubishi condenser (serving level 10)	68	1 m away from condenser, dominated by plant item
2	Mitsubishi condenser (serving level 7)	69	1 m away from condenser, dominated by plant item
3	Mitsubishi condenser (serving level 8)	70	1 m away from condenser, dominated by plant item
4	Daikin condenser	69	1 m away from condenser, dominated by plant item (3 more in operation nearby)
5	Mitsubishi condenser	70	1 m away from condenser, dominated by plant item,

Meas ref.	Plant item/Background noise level	Sound pressure level measured, $L_{Aeq,1 \text{ min}}$ (dB)	Notes
			some rattling from vibration
6	Mitsubishi condenser	69	1 m away from condenser, dominated by plant item
7	Mitsubishi condenser	66	1 m away from condenser, dominated by plant item – same unit as measurement 1 but with nearby units switched off
<i>Byrom roof plant deck</i>			
8	Mitsubishi VRF unit	69	1 m away from VRF, some contribution from other VRF
9	Mitsubishi VRF unit	70	1 m away from VRF, some contribution from other VRF
10	Mitsubishi condenser	69	1 m away from condenser, nearby condensers switched off
11	Mitsubishi condenser	69	1 m away from condenser, nearby condensers switched off
12	Mitsubishi condenser	68	1 m away from condenser, nearby condensers switched off
13	Mitsubishi condenser	68	1 m away from condenser, nearby condensers switched off
<i>Level 3 rooftop plant deck</i>			
17	Mitsubishi VRF	68	1 m away from VRF, dominated by unit
18	AHU casing	61	> 1 m away from casing, dominated by AHU noise

Meas ref.	Plant item/Background noise level	Sound pressure level measured, $L_{Aeq,1 \text{ min}}$ (dB)	Notes
			although contribution from other plant items noted.

5 Plant noise egress assessment

5.1 Plant items and locations

A list of the plant items noted on site are provided below. Plant locations are shown in Figure 2 to Figure 4:

- Astley building:
 - 10 x Mitsubishi condensers
 - 6 x Daikin condensers
- Byrom building:
 - 20 x Mitsubishi condensers
 - 2 x Mitsubishi VRF units
- Level 03 plant deck
 - 6 x Mitsubishi condenser
 - 7 x Mitsubishi VRF unit

The Level 03 plant deck also included tenant plant items for Everyman Cinema. Assessment of these plant items are outside the scope of this report, as this has been previously assessed by RBA Acoustics as detailed in RBA report 8898.RP01.PNA.0 *Plant Noise Assessment*.

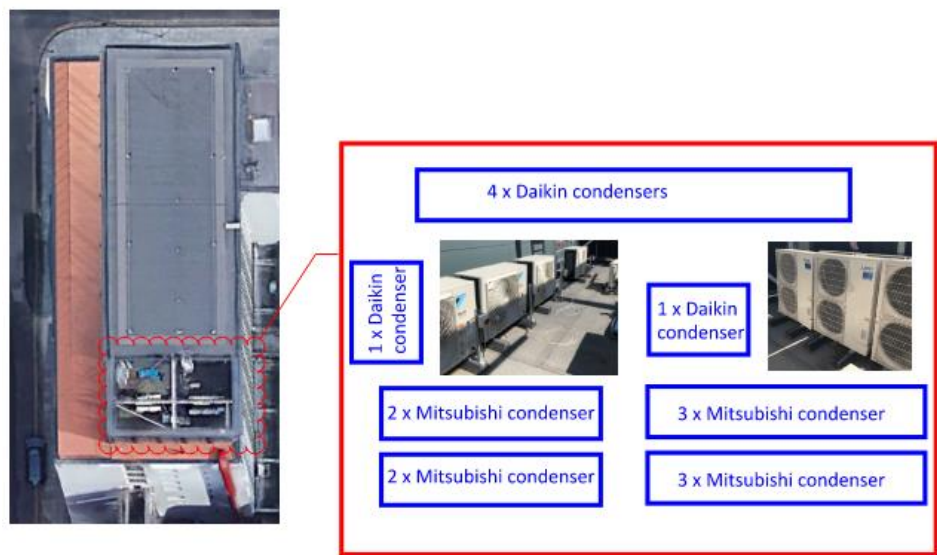


Figure 2 Annotated aerial view of the Astley rooftop plant

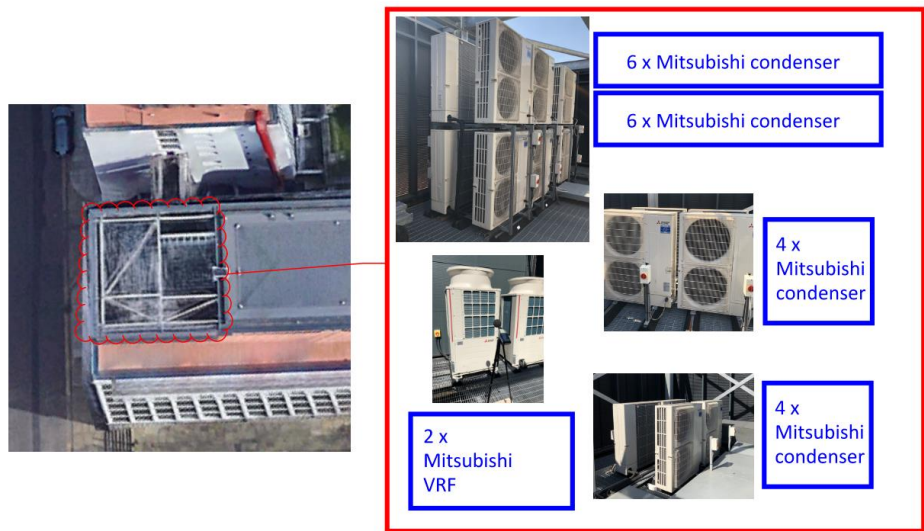


Figure 3 Annotated aerial view of the Byrom rooftop plant

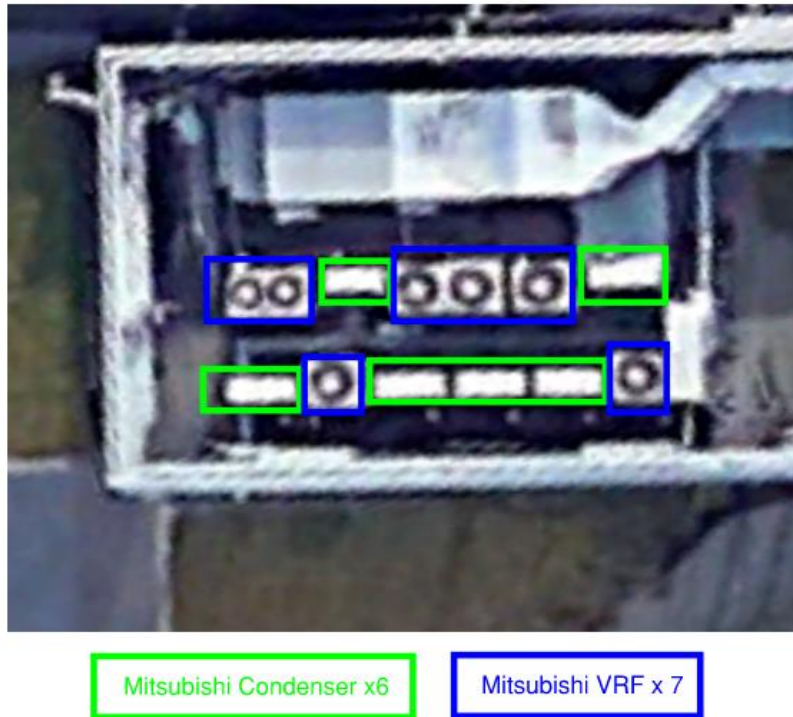


Figure 4 Annotated aerial view of the level 3 plant deck

5.2 Assessment

An assessment of plant noise egress has been carried out to the three nearest noise sensitive receptors as identified in the planning noise report and shown in Figure 1.

The assessment is based on the plant noise levels measured as set out in Section 4.3, and includes distance and screening attenuation, where applicable, to the nearest noise sensitive premises.

The results of the assessment are set out in Table 3.

Table 3 Predicted noise level at noise sensitive premises

Noise sensitive premises	Predicted noise level, L_{Aeq} (dB)
Rosetti Place	55
One Spinningfields	50
St John's Court	64

The predicted noise levels at all nearest noise sensitive premises are expected to exceed the plant noise egress limits outlined in Table 1.

It is understood that the landlord and tenant plant operate at a reduced duty during the night-time.

5.2.1 Attention catching characteristics

Regarding intermittency, the specific sound level of each plant item is predicted to be at least 5 dB below the representative background sound level and as such any intermittency is not expected to be readily distinctive against the residual acoustic environmental. Therefore, no corrections for intermittency are considered to be appropriate.

Regarding tonality, none of the individual plant items were identified as having tonal characteristics, as such no correction is required

5.3 Additional mitigation required

Further mitigation will be required to meet plant noise egress limits at the nearest noise sensitive premises. This comprises of solid backing to the louvres at all three plant areas.

The solid backing should consist of a minimum density of 15 kg/m² and would need to block the line of sight to the nearest noise sensitive receptors. The locations of the recommended solid backing are shown in Figure 5 to Figure 7.

Acoustic louvres could also be an option to provide screening if ventilation is needed.

This mitigation will be suitable in meeting both daytime and night-time plant noise egress limits.

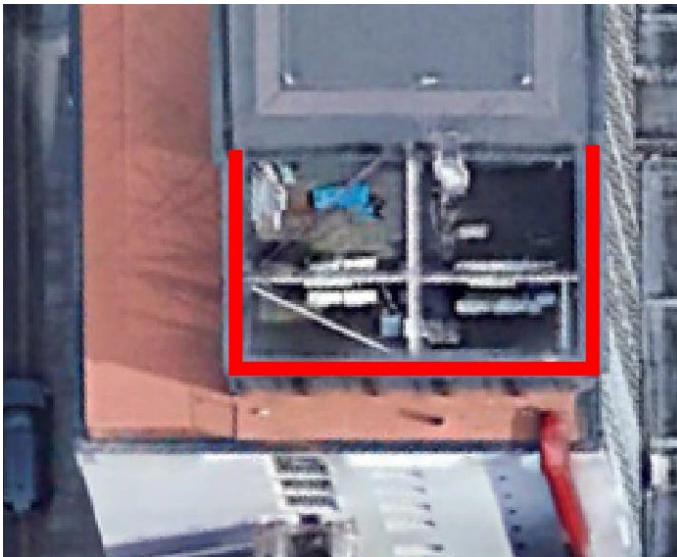


Figure 5 Location of required screening on Astley Building

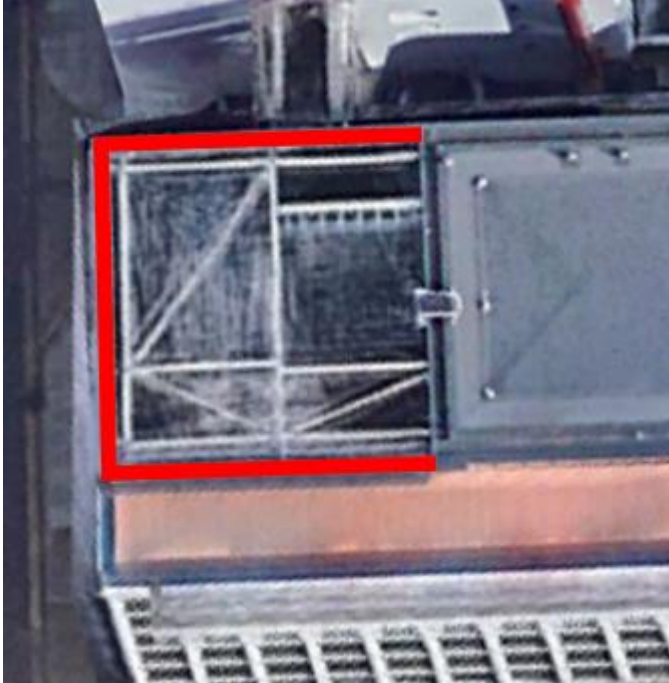


Figure 6 Location of required screening on Byrom Building



Figure 7 Location of required screening on Level 03 plant deck

5.3.1 One Spinningfields

The mitigation measures outlined in Section 5.3 is predicted to allow the plant noise egress limits to be met at Rossetti Place and St Johns Court. However, at One Spinningfields, the predicted plant noise egress level is L_{Aeq} 47.5 dB. This is due to a direct line of sight with the Level 3 plant deck from the upper floors of the One Spinningfields building.

This value exceeds the plant noise egress limits set out in Table 2 by 1.5 dB. This is considered to be within the combined measurement and calculation tolerances due to the following:

- It was not possible to record measurements of the isolated plant items, as a result measured data may have included contributions from other plant items causing potential for the measured data to represent a worst case of up to + 3 dB.
- There is a calculation and measurement tolerance of ± 1 dB.

In addition:

- the measurements were carried out on a hot day when all plant is expected to have been running at maximum design duty (worst-case). As such, the plant noise egress levels are likely to be lower than those measured, on a typical day.
- One Spinningfields is a commercial office building with a fully sealed, non-openable facade consisting of double glazing. The predicted worst-case plant noise egress levels are 3.5 dB below the background noise levels outside this receptor. Therefore, once facade sound insulation is considered, there is negligible risk of disturbances occurring given the context of this receptor.

Appendix A

Survey details

Equipment

Attended noise measurements were taken using a Brüel & Kjær 2250 sound level meter.

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
2250 (F)				
Sound level meter	2250/3011964	Brüel & Kjær	8 Sep 23	UCRT21/2089, UCRT21/2090
Microphone	4189/3100176	Brüel & Kjær	8 Sep 23	UCRT21/2089, UCRT21/2090
Pre-amp	ZC0032/26376	Brüel & Kjær	8 Sep 23	UCRT21/2089, UCRT21/2090
Calibrator	4231/3019123	Brüel & Kjær	8 Sep 23	UCRT21/2086

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

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

Weather conditions

During the attended noise measurements, the weather was generally clear and dry and no rain occurred.

The reported temperature during the survey was 30°C. Due to the high temperatures, the external cooling plant was likely running at maximum duty.

These weather conditions are considered suitable for obtaining representative measurements.