

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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92-96 Deansgate, Manchester

Plant noise measurements and egress assessment

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

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Summary

Sandy Brown has been commissioned by Conway Estates Ltd to provide acoustic advice in relation to the proposed development at 92-96 Deansgate, Manchester, M3 2QG.

An environmental noise survey has been carried out to determine the existing sound levels in the area, and set appropriate plant noise limits in line with the requirements of Manchester City Council (MCC). The noise survey was performed between 13:45 on 4 May 2021 and 14:00 on 5 May 2021. The representative background sound levels measured during the survey were $L_{A90,15min}$ 56 dB during the daytime and $L_{A90,15min}$ 55 dB at night.

Based on the requirements of Manchester City Council (MCC) and on the results of the noise survey, all plant must be designed such that the cumulative noise levels at 1 m from the worst affected window of the nearby noise sensitive premises is to be at least 5 dB below the typical background noise levels measured. These limits are cumulative, and apply with all plant in operation under normal conditions. If plant items contain tonal or attenuation catching features, a penalty based on the type and the impact of those features will be applied, and the limits will be more stringent than those set.

Details of the measurement results, methods and limits are set out in Sandy Brown report 21184-R01-C Noise survey and plant noise egress assessment dated 2 December 2021.

Following installation of the plant, sample noise measurements were carried out on 5 April 2023 to determine the actual noise emissions, and to ensure compliance with the criteria at the nearest noise sensitive premises.

Manchester City Council have provided with planning conditions and comments in relation to this development.

Planning condition 6

- a) *Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with the recommendations in the 'Noise survey and plant noise egress assessment ref 21184-R01-C' dated 2 December 2021. The measures shall be implemented in full prior to first use of the development.*
- a) *Prior to first use of the equipment, 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 development 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.*

The predicted noise egress levels at the nearest noise sensitive premises comply with the relevant noise limits during the daytime, and further mitigation measures are not required. On this basis Planning Condition 6 can be discharged.

In addition, it is noted that a further acoustics condition (Condition 5) was attached to the planning permission.

Planning Condition 5

- b) The premises shall be acoustically insulated and treated in accordance with the recommendations in the 'Noise survey and plant noise egress assessment ref 21184-R01-C 'dated 2 December 2021. The measures shall be implemented in full prior to first use of the equipment.*
- c) Prior to first use of the development a verification report will be required to validate that the work undertaken through the development confronts to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that acceptable 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.*

Subsequent correspondence between Paul Butler Associates and Emily Booth, Planning Officer at Manchester City Council has established that Condition 5 was attached in error. The planning officer has therefore agreed that this condition can be discharged in the absence of the submission of any supporting information.

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1 Introduction

Sandy Brown has been commissioned by Conway Estates Ltd to provide acoustic advice in relation to the proposed development at 92-96 Deansgate, Manchester, M3 2QG.

An environmental noise survey has been carried out to determine the existing sound levels in the area, and set appropriate plant noise limits in line with the requirements of Manchester City Council (MCC). The noise survey was performed between 13:45 on 4 May 2021 and 14:00 on 5 May 2021. Details of the measurement results, methods and limits are set out in Sandy Brown report *21184-R01-C Noise survey and plant noise egress assessment* dated 2 December 2021.

Sample noise measurements of the installed plant were provided on site on 5 April 2023 to demonstrate compliance with Planning Condition 6 received from Manchester City Council.

This report presents the survey method, results of the environmental noise survey, and provides with a noise egress assessment at the nearest noise sensitive premises.

The predicted noise egress levels at the nearest noise sensitive premises comply with the relevant noise limits during the daytime, and further mitigation measures are not required.

In addition, it is noted that a further acoustics condition (Condition 5) was attached to the planning permission. Correspondence between Paul Butler Associates and Emily Booth, Planning Officer at Manchester City Council has established that Condition 5 was attached in error. The planning officer has therefore agreed that this condition can be discharged in the absence of the submission of any supporting information.

2 Site description

2.1 The site and its surrounding

The site location in relation to its surroundings is outlined in yellow in Figure 1. The site is located in Manchester City Centre and is bounded by Deansgate (A56) to the east and St Mary's Street to the south.

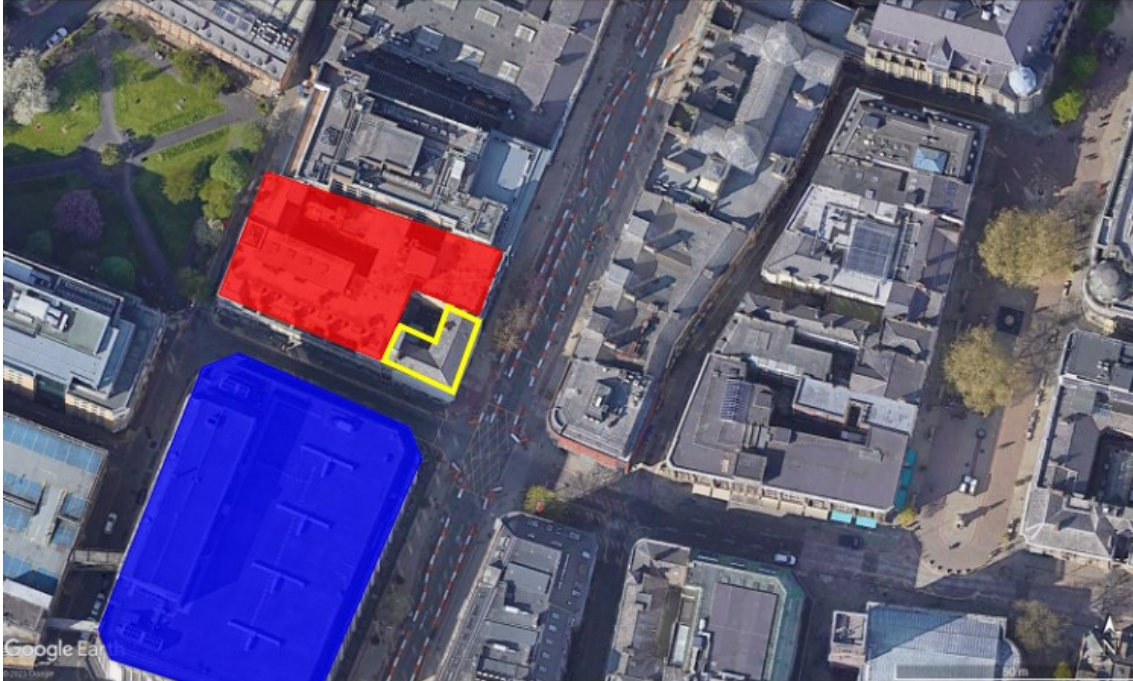


Figure 1 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The site is located in a mixed-use area, with immediate surrounding comprising retail, commercial and office accommodation. It is understood that there is not residential accommodation in the immediate vicinity.

The nearest noise sensitive premises is 90 Deansgate to the north west and is highlighted red in Figure 1.

There is a commercial building approximately 11 m to the south (98-116 Deansgate), this is highlighted in blue in Figure 1.

The location of the proposed items of plant are fully screened from any other building in the vicinity.

3 Development proposals

The proposed development comprises the installation of three external condenser units on the fourth-floor flat roof terrace (within a lightwell). Solid acoustic screening is installed around the plant area to block line of sight to the nearby noise sensitive premises.

The condenser units will supply the commercial accommodation and are proposed to operate during daytime hours (07:00 – 23:00) only. Night-time operation is not proposed.

4 Manchester City Council planning conditions

4.1 Plan noise egress limits

130403/FO/2021 Planning Condition 6 states the following:

- a) *Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with the recommendations in the 'Noise survey and plant noise egress assessment ref 21184-R01-C' dated 2 December 2021. The measures shall be implemented in full prior to first use of the development.*
- d) *Prior to first use of the equipment, 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 development 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.*

In addition, 130403/FO/2021 Planning Condition 5 states the following:

- a) *The premises shall be acoustically insulated and treated in accordance with the recommendations in the 'Noise survey and plant noise egress assessment ref 21184-R01-C' dated 2 December 2021. The measures shall be implemented in full prior to first use of the equipment.*
- b) *Prior to first use of the development a verification report will be required to validate that the work undertaken through the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that acceptable 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.*

5 Plant noise egress limits

Based on the results of the noise survey and requirements of the Local Authority, limits for the normally operating plant were set out in 21184-R01-C *Noise survey and plant noise egress assessment* dated 2 December 2021 and summarised 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)
<i>Office accommodation (90 Deansgate and 98-116 Deansgate)</i>	
Daytime (07:00-23:00)	51
Night-time (23:00-07:00)	50

^[1] The limits set out in Table 1 do not include any attention catching features. Penalty corrections for attention catching features may be significant and will need to be considered as the building services design progresses. This is discussed in Appendix B.

6 Plant noise measurements

Attended sample measurements were taken at 6 locations around the condenser units on the level 4 terrace. These are indicated in Figure 3 as positions 1 to 6. The attended measurements were carried out on 5 April 2023, over 1 minute periods. Based on observations on site, the measurement periods are considered suitable to obtain representative measurements results of plant operation.

For positions 1, 3 and 5 the microphone was mounted on a tripod approximately 1.2 m above the ground level and at 1 m from a reflective surface.

For positions 2,4 and 6, the microphone was mounted on a tripod and approximately 1m from the top of each unit.

Each unit is servicing a different floor level and understood they have been designed with different loads. On this basis, measurements of each unit in normal operation were carried out to account for potential differences in noise levels.

The design duty for this units was set to 60% of the fan speed, which is the normal operation.

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

Dominant noise sources occurring during the measurements were noted.

A photograph showing the measurement location at position 1 is shown in Figure 2.



Figure 2 Photograph showing the location of the attended measurement for Position 1

The measurements positions are indicated in Figure 3.

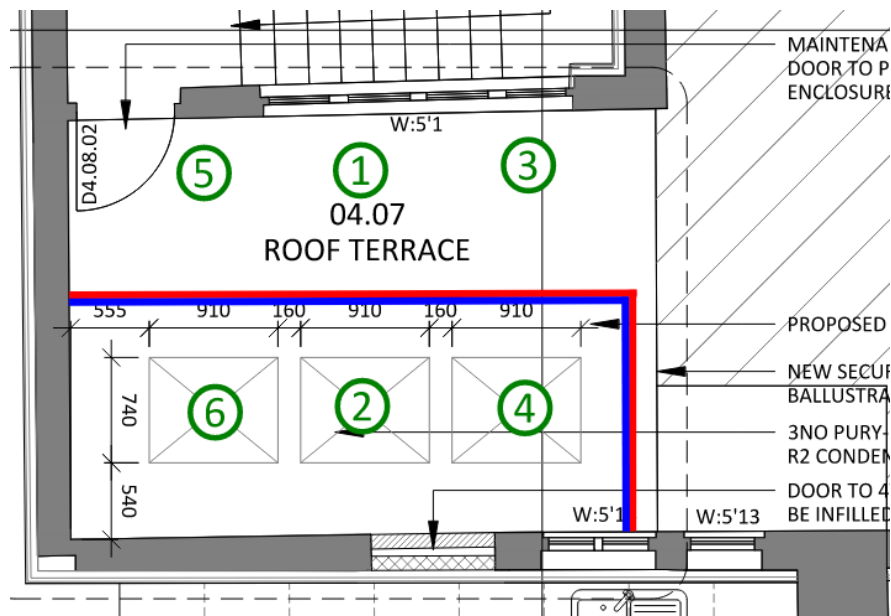


Figure 3 Level 4 layouts showing the location of the attended measurements

6.1 Weather conditions

Weather conditions during the survey are described in Appendix A.

7 Noise survey results

7.1 Observations

The dominant noise sources observed at the site during the survey were from installed plant in operation. Less significant noise sources included distant plant in operation.

7.2 Noise measurement results

7.2.1 Attended measurement results

Noise levels and key sources recorded during the attended measurements are summarised in Table 2. For positions 1, 3 and 5, the measurements are considered facade measurements. For Measurements positions 2, 4 and 6 are considered free-field measurements.

Table 2 Noise levels and key noise sources from attended measurements

Position	Start time	Sound pressure levels (dB)			Comments
		$L_{Aeq,1min}$	$L_{AFmax,1min}$	$L_{A90,1min}$	
1	16:23	59	62	57	Measured noise levels dominated by unit servicing level 2 through the installed screen, other contribution from distant plant in operation
	16:24	59	61	57	
	16:25	59	62	57	
2	16:32	62	63	62	Measured noise levels at the top of the unit dominated by the unit in operation, other contribution from distant plant in operation
	16:33	61	62	61	
	16:34	61	62	61	
3	16:02	55	60	54	Measured noise levels dominated by unit servicing level 3 through the installed screen, other contribution from distant plant in operation
	16:03	55	56	54	
	16:04	54	57	53	

Position	Start time	Sound pressure levels (dB)			Comments
		$L_{Aeq,1min}$	$L_{AFmax,1min}$	$L_{A90,1min}$	
4	16:08	70	74	67	Measured noise levels at the top of the unit dominated by the unit in operation, other contribution from distant plant in operation
	16:09	71	74	68	
	16:10	72	73	71	
5	17:04	60	63	59	Measured noise levels dominated by unit servicing level 4 through the installed screen, other contribution from distant plant in operation
	17:05	60	63	59	
	17:06	60	63	59	
6	17:11	60	62	60	Measured noise levels at the top of the unit dominated by the unit in operation, other contribution from distant plant in operation
	17:12	61	62	60	
	17:13	61	63	61	

8 Plant noise egress assessment

Calculations have been carried out to determine the noise rating levels from the proposed plant items outside the nearest noise sensitive premises, taking into account the following:

- Attenuation due to distance and installed acoustic screening (details below)
- Plant units operating simultaneously at 60% duty in continuous operation during daytime and switched off at night
- The noise egress level outside the receptor does not contain any perceivable tonal or impulsive characteristics
- Directivity due to reflections from nearby surfaces.

The installed screening build-up is 24 mm solid plywood (600 kg/m³) and 50 mm exposed mineral fibre insulation (12 kg/m³) sound absorbent lining, and is positioned approximately 400 mm from each unit. A picture of the installed screening is provided in Figure 4.



Figure 4 Photographs showing the installed screening (left- terrace side, right plant side)

Based on the survey results and guidance given in BS4142 2014+A1 2019, the specific noise rating levels at the nearest noise sensitive premises resulting from the operation of the proposed items of plan have been predicted at 1 m from the worst affected window of the nearest daytime noise sensitive premises. are summarised in Table 3.

Table 3 Predicted noise level from the operation of the proposed items of plant at nearest noise sensitive premises

Location	Calculated noise egress level L_{Aeq} (dB)	Attention catching characteristic correction	Specific noise rating level (dB)	Background noise level measured ($L_{A90,15min}$ dB)	BS4142:2014 assessment of likely impact
90 Deansgate	45	0 dB	45	56	Low
98-116 Deansgate	46	0 dB	46	56	Low

The predicted noise egress levels at the nearest noise sensitive premises comply with the relevant noise limits during the daytime, and further mitigation measures are not required.

The predicted levels are at least 10 dB below the background noise levels and as such they meet the requirements of Planning Condition 6, this can therefore be discharged.

9 Conclusion

An environmental noise survey has been carried out to determine the existing sound levels in the area, and set appropriate plant noise limits in line with the requirements of Manchester City Council (MCC). The noise survey was performed between 13:45 on 4 May 2021 and 14:00 on 5 May 2021.

Details of the measurement results, methods and limits are set out in 21184-R01-C Noise survey and plant noise egress assessment dated 2 December 2021.

In addition, measurements of the plant installed with mitigation measures provided on site were carried out on 5 April 2023 to demonstrate compliance with noise egress criteria at the nearest noise sensitive premises and discharge Planning Condition 6.

The predicted noise egress levels at the nearest noise sensitive premises comply with the relevant noise limits during the daytime, and further mitigation measures are not required. On this basis Planning Condition 6 can be discharged.

In addition, it is noted that a further acoustics condition (Condition 5) was attached to the planning permission. Correspondence between Paul Butler Associates and Emily Booth, Planning Officer at Manchester City Council has established that Condition 5 was attached in error. The planning officer has therefore agreed that this condition can be discharged in the absence of the submission of any supporting information.

Appendix A

Survey details

Equipment

The attended noise measurements were taken using a Rion NL-52 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
Sound level meter	NL-52/01143564	Rion	15 Dec 24	TCRT22/1766
Microphone	UC-59/10153	Rion	15 Dec 24	TCRT22/1766
Pre-amp	NH-25/43581	Rion	15 Dec 24	TCRT22/1766
Calibrator	NC-74/34257023	Rion	15 Dec 24	TCRT22/1765

[1] 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.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

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 overcast and drizzling occurred during measurements, the temperature was 10 °C. Wind speeds were measured at each position and varied between 0 m/s and 2 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied 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 accounted for 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 of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

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