

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Epic Games, Bright Building, Manchester

Noise survey and plant noise egress limits

London, Manchester, Edinburgh, Birmingham, Belfast, Leeds

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Summary

Sandy Brown has been commissioned by Epic Games Animation UK Ltd to provide acoustic advice in relation to the proposed development at the Bright Building, Manchester.

An environmental noise survey has been carried out to determine the existing sound levels in the area. The noise survey was performed between 11:45 on 4 February 2022 and 09:00 on 9 February 2022.

The representative background sound levels measured during the survey were $L_{A90,15min}$ 47 dB during the daytime and $L_{A90,15min}$ 42 dB at night.

Based on the requirements of the Manchester City Council and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed $L_{Aeq,15min}$ 45 dB during the daytime, and $L_{Aeq,15min}$ 40 dB during the night. These limits are cumulative and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied, and the limits will be more stringent than those set.

An assessment of plant noise egress has been undertaken. The results of this assessment indicate that the daytime (07:00-23:00) and night-time (23:00-07:00) plant noise egress limits are expected to be complied with.

Contents

1 Introduction 5

2 Site description 5

3 Development proposals 6

4 Building services noise egress criteria 6

5 Noise survey method 7

6 Noise survey results 7

7 Plant noise assessment 10

8 Conclusion 12

Appendix A 13

 Survey details 13

Appendix B 16

 Results of unattended measurements at Location ‘L1’ 16

Appendix C 18

 BS 4142 corrections for attention catching features 18

1 Introduction

Sandy Brown has been commissioned by Epic Games Animation UK Ltd to provide acoustic advice in relation to the proposed development at the Bright Building, Manchester.

As part of this, an environmental noise survey is required, the purpose of which is to establish the existing background sound levels in the vicinity of nearby noise sensitive premises and to set appropriate limits for noise egress from building services plant.

This report presents the survey method and results, and a discussion of acceptable limits for noise emissions from building services plant.

2 Site description

2.1 The site and its surrounding

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



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

2.2 Adjacent premises

The nearest residential dwellings are considered to be the apartments located along Burlington Street. These are shown in Figure 1 highlighted in blue.

The site is bounded by a number of office premises. These are shown in Figure 1 highlighted in green.

The office premises are only considered noise sensitive during the daytime (07:00-23:00). The residential premises are considered noise sensitive during both the daytime (07:00-23:00) and night-time (23:00-07:00).

3 Development proposals

Epic Games are occupying office space within the Bright Building. As part of their fit-out works, new mechanical plant is required to be installed at the rooftop plant area. It is understood that the new plant will operate during the daytime (07:00-23:00) and night-time (23:00-07:00), but will likely operate at a lower duty during the night. The operation of the proposed plant is to be confirmed by the building services engineer.

4 Building services noise egress criteria

4.1 Standard guidance

BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at nearby noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

4.2 Manchester City Council criteria

Manchester City Council set out plant noise egress criteria with the *Planning & Noise Technical Guidance 2015* document which states the following in relation to building services plant noise egress:

'The development should be designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location'

5 Noise survey method

The survey included unattended and attended noise measurements.

5.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 6 days.

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

The unattended measurements were taken over 15 minute periods between 11:45 on 4 February 2022 and 09:00 on 9 February 2022. The equipment was installed and collected by Kane Mitchell.

The measurement position used during the survey is indicated in Figure 1, denoted by the label 'L1'. The measurement position was located on the rooftop of the Bright Building. The measurement position was chosen such that noise emissions from the exiting rooftop plant items did not significantly impact the measurement results, whilst not being screened from the noise sources which are typical of the surrounding noise sensitive premises.

This location was considered to be reasonably representative of noise levels at the site and outside the nearest noise sensitive premises.

5.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

Heavy rain occurred during the night of 5 February and morning of 6 February 2022 between 23:00 and 06:00. The noise data measured between these time periods are not considered representative and have been excluded from the survey results and subsequent assessments.

6 Noise survey results

6.1 Observations

The dominant noise sources observed at the site during the survey were from road noise.

Less significant noise sources included distant construction noise, building services plant noise and pedestrians at ground level.

6.2 Noise measurement results

6.2.1 Unattended measurement results

A graph showing the results of the unattended measurements is provided in Appendix B.

Day and night-time ambient noise levels measured during the unattended survey are presented in Table 1.

Table 1 Ambient noise levels measured during the unattended survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
4 Feb 22	54 ^[1]	49
5 Feb 22	53	49
6 Feb 22	54	47
7 Feb 22	53	47
8 Feb 22	53	48
9 Feb 22	53 ^[1]	-
Average	53	49

[1] Measurement not made over full period due to monitoring start and end time (the measurement on 4 February 2022 was over 11 hours, and on 9 February 2022 over 2 hours); not included in the average.

In line with BS 4142:2014+A1:2019, representative background sound levels have been determined using statistical analysis of the continuous measurements.

Daytime and night-time statistical analysis of representative values for the site are given in Figure 2 and Figure 3.

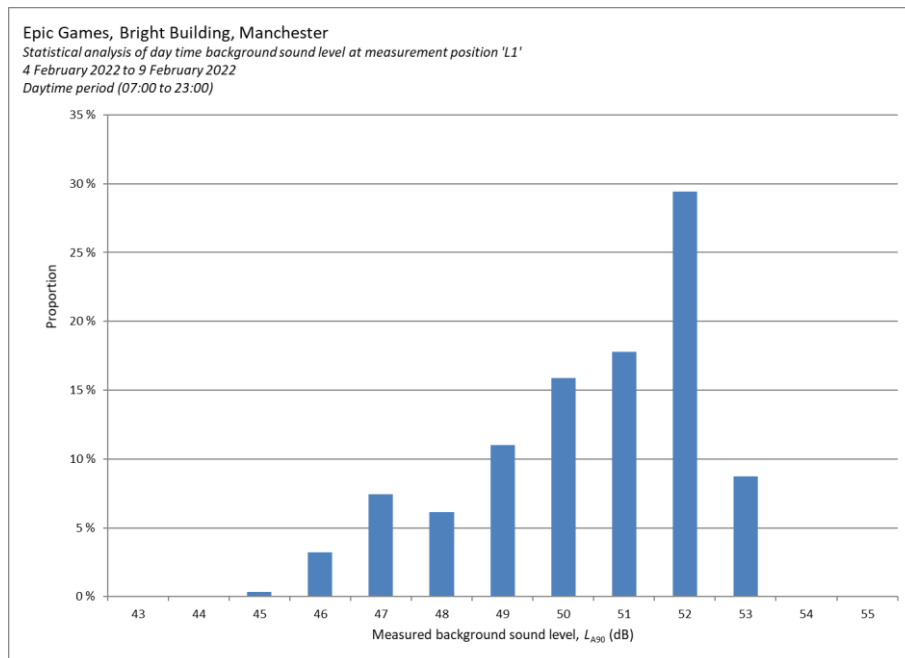


Figure 2 Daytime statistical analysis of background sound levels at location 'L1'

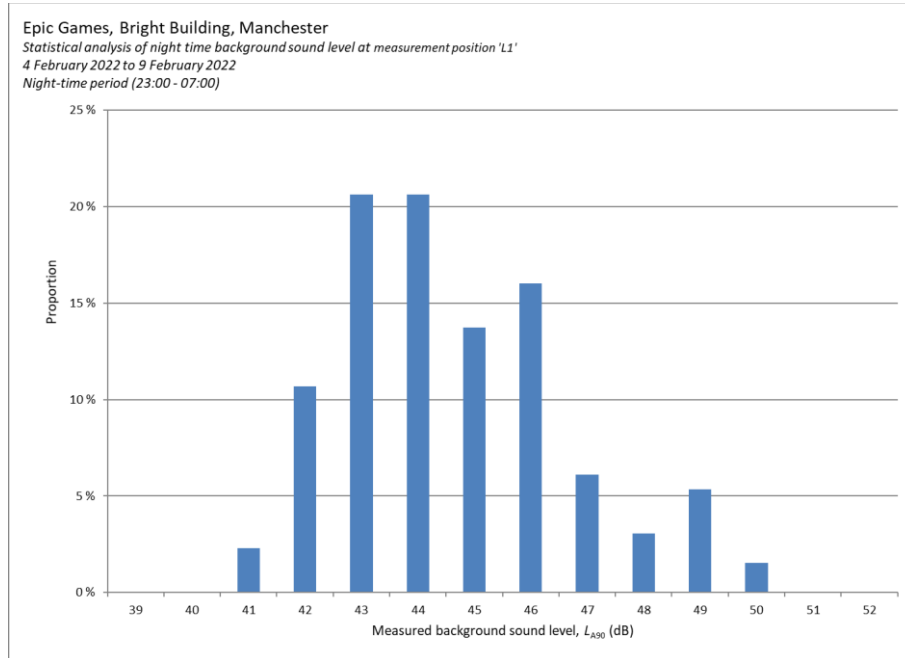


Figure 3 Night-time statistical analysis of background sound levels at location 'L1'

From this analysis, the representative background sound levels measured during the survey were $L_{A90,15min}$ 47 dB during the daytime and $L_{A90,15min}$ 42 dB at night.

6.3 Basic limits

Based on the above criteria and the measurement results, the cumulative noise level from the operation of all new plant should not exceed the limits set out in Table 2.

The limits apply at 1 m from the worst affected windows of the nearest noise sensitive premises and are presented as facade levels. These have been corrected relative to the measured free-field background noise levels by the addition of 3 dB.

In this case these limits would apply at the surrounding office premises and residential dwellings as described in Section 2.2 during the daytime (07:00-23:00) and at the residential dwellings during the night-time (23:00-07:00).

Table 2 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)	45
Night-time (23:00-07:00)	40

[1] The limits set out in Table 2 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 C.

7 Plant noise assessment

7.1 Proposed items of plant

A number of condenser units are to be located on the rooftop plant area. The locations of these units are shown in Figure 4 as follows:

- 3 rows of 2 M-MOCU-G2-050 condenser units, shown in green
- 1 x PURY-P400YNW-A1 condenser unit, shown in blue.

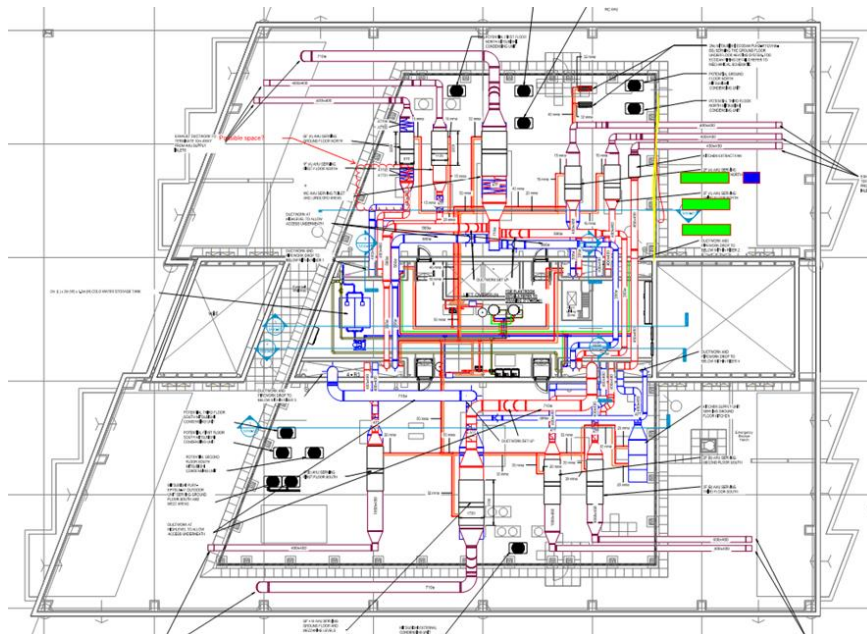


Figure 4 Rooftop plant item locations

7.2 Plant data

Broadband sound pressure level data has been provided for the proposed rooftop condenser units. This data is as follows:

- M-MOCU-G2-050 condenser unit - L_{Aeq} 65 dB at 1 m
- PURY-P400YNW-A1 condenser unit - L_{Aeq} 69 dB at 1 m

For the purpose of this assessment, representative spectra have been used which correspond to the respective broadband values. These are set out in Table 3.

Table 3 Representative condenser unit sound pressure spectra

	Sound pressure level, L_{eq} (dB)							
	Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
M-MOCU-G2-050 condenser unit	76	75	61	62	58	55	51	47
PURY-P400YNW-A1 condenser unit	80	79	65	66	62	59	55	51

7.3 Assessment

Calculations have been undertaken to assess plant noise egress to the surrounding noise sensitive premises. These calculations consider screening from buildings and distance attenuation.

The predicted levels are:

- Worst-affected office premises - L_{Aeq} 44 dB
- Apartments located along Burlington Street - L_{Aeq} 39 dB.

As previously mentioned, the office premises are only considered noise sensitive during the daytime (07:00-23:00). The residential premises are considered noise sensitive during both the daytime (07:00-23:00) and night-time (23:00-07:00).

On this basis, the above levels of plant noise egress comply with the limits as per Section 6.3.

Regarding intermittency, the specific sound level of each plant items 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, only octave band noise data has been provided so it is not possible to assess any tonal characteristics from the proposed units. The representative spectral data used for the assessment does not contain any clear tones. As the specific sound level for each plant item is at least 5 dB below representative background sound level, tonal characteristics are not expected to be highly perceptible at the receptor. As such no corrections for tonality are considered to be appropriate.

8 Conclusion

The representative background sound levels from the noise survey were $L_{A90,15min}$ 47 dB during the day, and $L_{A90,15min}$ 42 dB during the night.

Based on the requirements of the Local Authority, the relevant plant noise limits at the worst affected existing noise sensitive premises are L_{Aeq} 45 dB during the day, and L_{Aeq} 40 dB during the night.

These limits are cumulative and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, the limits will be more stringent than those set out above. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied.

An assessment of plant noise egress has been undertaken. The results of this assessment indicate that the daytime (07:00-23:00) and night-time (23:00-07:00) plant noise egress limits are expected to be complied with.

Appendix A

Survey details

Equipment

The unattended noise measurements were taken using a RION NL52 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-52/00932326	Rion	16 Mar 23	TCRT21/1182
Microphone	UC-59/05549	Rion	16 Mar 23	TCRT21/1182
Pre-amp	NH-25/32354	Rion	16 Mar 23	TCRT21/1182
Calibrator	NC-74/34125432	Rion	16 Mar 23	TCRT21/1181

[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*.

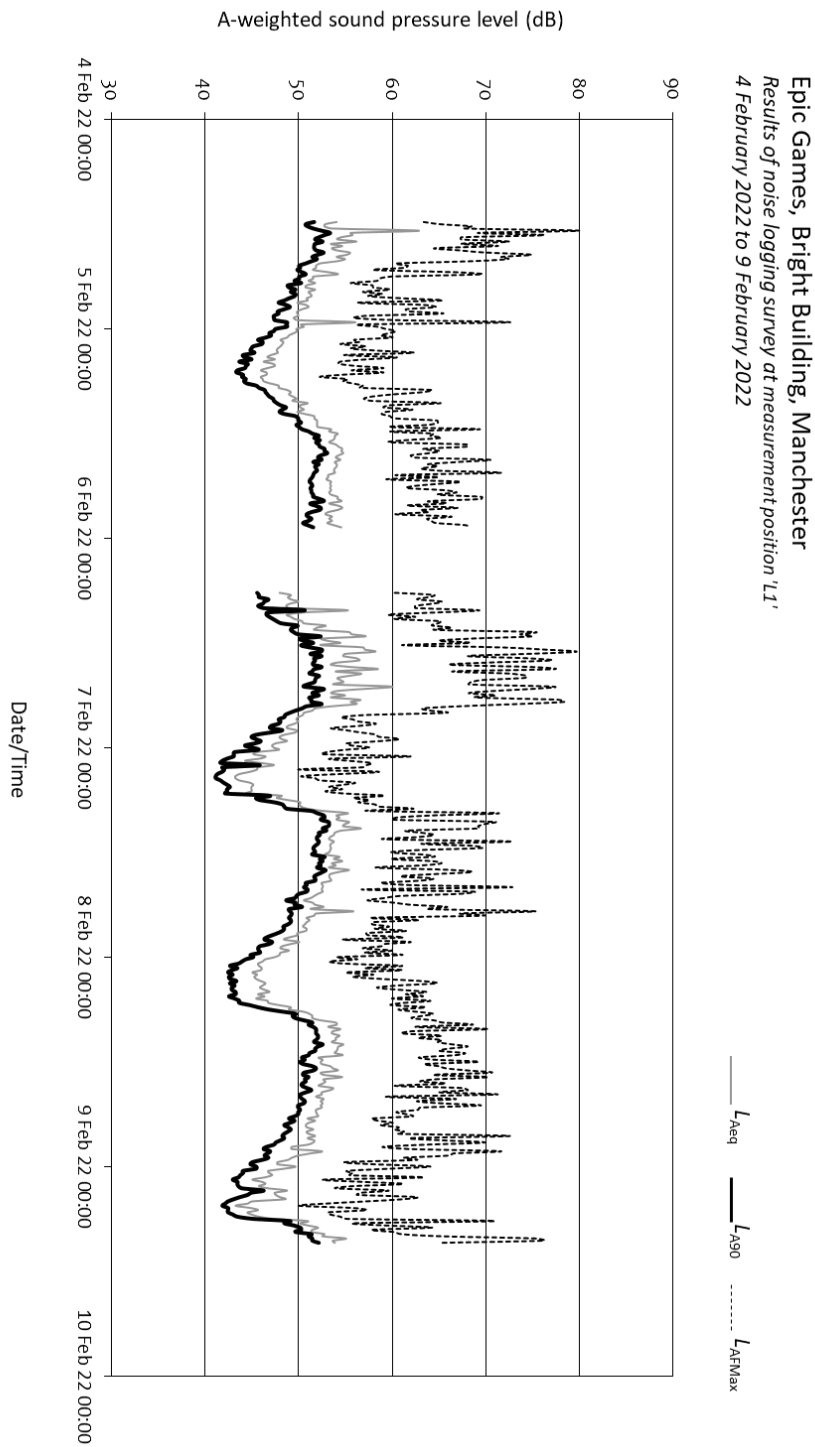
Weather conditions

During the unattended noise measurements, weather reports for the area indicated that temperatures varied between 1°C at night and 13°C during the day, and the wind speed was less than 5 m/s.

Heavy rain occurred during the night of 5 February and morning of 6 February 2022 between 23:00 and 06:00. The noise data measured between these time periods are not considered representative and have been excluded from the survey results and subsequent assessments.

Appendix B

Results of unattended measurements at Location 'L1'



Appendix C

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.