

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Kingston University, 71 Penrhyn Road

External noise ingress assessment

London, Manchester, Edinburgh, Birmingham, Belfast Leeds

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Summary

Sandy Brown has been commissioned by MG Partnership to provide an assessment of noise in relation to the proposed works at 71 Penrhyn Road, which will provide student accommodation for Kingston University.

An environmental noise survey has been carried out to establish ambient and maximum noise levels at the site.

Ambient and maximum noise levels are used to assess building envelope sound insulation requirements to achieve appropriate internal noise levels for residences. These follow standards set in accordance with Royal Borough of Kingston upon Thames (RBKT) guidelines and BS 8233:2014.

The development proposal includes a conversion of a three-storey house to provide student accommodation including a common kitchen and dining area. The existing facade of the building is to be assessed with regards to performance to achieve internal noise level criteria according to BS 8233:2014.

Unattended noise monitoring was undertaken at the site over 7 days. Both the internal and external unattended measurements were taken over 2-minute periods between 12:10 on 8 February 2023 and 02:00 on 14 February 2023.

The 10th highest night-time maximum noise levels measured during the survey were L_{AFmax} 58 dB internally and L_{AFmax} 80 dB externally. The average noise levels during the daytime period were $L_{Aeq,16h}$ 48 dB internally and $L_{Aeq,16h}$ 68 dB externally, during the night-time period the levels were $L_{Aeq,8h}$ 37 dB internally and $L_{Aeq,8h}$ 63 dB externally.

The internal noise levels measured do not meet the RBKT noise ingress criteria and therefore windows will need to be replaced. The external noise levels measured indicates that openable windows cannot be relied on to provide ventilation and still meet the internal noise limits, ie alternative ventilation will need to be provided.

The recommended minimum window sound insulation requirements to achieve the internal noise level for bedrooms / living rooms is R'_w+C_{tr} 30 dB.

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1 Introduction

Sandy Brown has been commissioned by MG Partnership to provide an assessment of noise in relation to the proposed development works at 71 Penrhyn Road, which will provide student accommodation for Kingston University.

An environmental noise survey has been carried out to establish ambient and maximum noise levels at the site.

The survey results are used to assess building envelope sound insulation requirements to achieve appropriate internal noise levels for residences. These follow standards set in accordance with Royal Borough of Kingston upon Thames (RBKT) guidelines and BS 8233:2014.

This report provides details of the noise survey, including measurement results, and provides recommendations.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in blue in Figure 1. The site is located to the east of the A240, which is a busy road. There are Kingston University buildings to the rear of 71 Penrhyn Road.

The site is surrounded by a mixture of residential, commercial and education premises.

The nearby noise sensitive premises, as shown in Figure 1, are as follows:

1. 69 Penrhyn Road (residential student accommodation)
2. 73 Penrhyn Road (residential student accommodation)
3. 75 Penrhyn Road (residential student accommodation)

The letter 'A' donates both unattended measurement positions (one on the ground floor internally and the other on the first floor externally). An image showing the measurement locations is shown within Figure 2.

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



Figure 2 Image showing both measurement locations

3 Development proposals

The development proposal includes a conversion of a three-storey house to provide student accommodation including common kitchen and dining area. The existing facade of the building is to be assessed with regards to performance to achieve internal noise level criteria according to BS 8233:2014.

4 Assessment criteria

4.1 Noise ingress

4.1.1 Local Authority requirements

The site lies within the jurisdiction of RBKT. As a part of the planning application, a requirement has been issued by RBKT as follows:

“Before the development is commenced a scheme shall be submitted to and approved in writing by the Local Planning Authority to demonstrate that the noise level of 35 dB LAeq,16 hour in living rooms and bedrooms during the daytime (0700 to 2300 hours) and 30 dB LAeq,8 hour during the night time (2300 to 0700 hours) in bedrooms, in accordance with BS8233:2014, shall not be exceeded. Noise levels in bedrooms should also not normally exceed 45 dB LAmax,F more than 10 times during the night time. Where these levels cannot be met with windows open appropriate acoustic ventilation should be provided so that the room can be sufficiently ventilated. The acoustic performance of any passive vent, variable speed mechanical air supply unit or whole house ventilation must be sufficient to ensure that the noise level standards given above are not compromised. The acoustic performance of any passive vent, variable speed mechanical air supply unit or whole house ventilation must be sufficient to ensure that the noise level standards given above are not compromised.”

The planning requirement relates to BS 8233:2014, which is outlined within section 4.1.2.

4.1.2 British Standard guidance

Guidance on acceptable internal noise levels in residential dwellings is given in BS 8233:2014 *Sound insulation and noise reduction for buildings*. The guidance limits are shown in Table 1.

These internal levels are based on annual average data and do not have to be achieved in all circumstances. It is normal to exclude occasional events, such as fireworks night or New Year's Eve.

Table 1 Internal noise criteria for sleeping/resting

Internal space	Indoor ambient noise level, L_{Aeq} (dB)	
	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
Living rooms	35	-
Dining room	40	-
Bedrooms	35	30 ^[1]

^[1] BS 8233 notes that individual noise events can cause sleep disturbance, and that a guideline value may be set depending on the character and number of events per night, although no specific limit is provided. For regular events, such as scheduled aircraft or passing trains, a guideline value may be set in terms of SEL or $L_{Amax,F}$. Sporadic noise events could require separate values.

The standard states that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

5 Survey method

5.1 Noise survey method

The survey included internal and external unattended measurements.

5.1.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 7 days.

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

Both the internal and external unattended measurements were taken over 2-minute periods between 12:10 on 8 February 2023 and 02:00 on 14 February 2023.

The measurement positions used during the survey are indicated in Figure 1. Denoted by the letters and 'A'. A photograph showing the measurement locations are provided in Figure 3 and Figure 4. These locations were chosen to be reasonably representative of noise levels at the facade and inside the building.

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Figure 3 Internal unattended measurement position



Figure 4 External unattended measurement location

5.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

6 Measurement results

6.1 Observations

6.1.1 Noise

The dominant noise source observed at the site during the survey was from traffic on the A240.

Less significant noise sources included plant from nearby buildings, construction activity and pedestrians.

6.2 Noise measurement results

6.2.1 Unattended measurement results

Graphs showing the results of both the internal and external the unattended measurements are provided in Appendix B.

Day and night-time ambient noise levels measured during the internal and external unattended surveys are presented in Table 2 and Table 3.

Table 2 Ambient noise levels measured during the internal unattended survey

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Wednesday 8 February 2023	- ^[1]	37
Thursday 9 February 2023	43	38
Friday 10 February 2023	43	38
Saturday 11 February 2023	42	37
Sunday 12 February 2023	42	36
Monday 13 February 2023	43	- ^[1]
Average	43	37

^[1] Measurement not made over full period due to monitoring start and end time; not included in the average.

Analysis of night-time maximum noise levels indicates that the night-time maximum noise level not normally exceeded 10 times a night is L_{AFmax} 58 dB.

Table 3 Ambient noise levels measured during the external unattended survey

Date	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)
	$L_{Aeq,16h}$ (dB)	$L_{Aeq,8h}$ (dB)
Wednesday 8 February 2023	-	63
Thursday 9 February 2023	69	63
Friday 10 February 2023	68	63
Saturday 11 February 2023	68	62
Sunday 12 February 2023	68	62
Monday 13 February 2023	68	-
Average	68	63

[1] Measurement not made over full period due to monitoring start and end time; not included in the average.

Analysis of night-time maximum noise levels indicates that the night-time maximum noise level not normally exceeded 10 times a night is L_{AFmax} 80 dB.

7 Discussion of results

The existing internal noise levels with the windows closed, and those expected with the windows open, exceeds the RBKT planning criteria. This is summarised in Table 1. As such, the windows will need to be replaced and an alternative means of ventilation will need to be provided.

Table 4 Expected internal noise levels

Internal space	Indoor ambient noise level, L_{Aeq} (dB)		
	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)	10 th highest L_{AFmax} (23:00 – 07:00)
Windows closed	43	37	58
Windows open	58	53	70
Planning limit	35	30	45

8 Facade sound insulation – noise ingress

This section describes an assessment of facade sound insulation to control noise ingress. The required facade specification largely depends on the external noise levels and the internal noise criteria.

The following assessment is based on achieving the internal noise levels recommended in BS 8233 and required by the RBKT, which are set out in Section 4.1.

8.1 External noise levels

The measured external noise level at the worst affected facade of the development is $L_{Aeq,16h}$ 68 dB during the daytime period, $L_{Aeq,8h}$ 63 dB during the night period. The maximum noise level at the facade not normally exceeded 10 times a night is L_{AFmax} 80 dB.

8.2 Facade sound insulation

The facade of the building comprises masonry brickwork and single glazed sash windows with timber frames. The worst affected facade is shown in Figure 5.



Figure 5 External facade showing the worst affected windows

The minimum recommended sound insulation performance for the windows (including any attenuated ventilation openings) is R'_w+C_{tr} 30 dB. This has been determined to achieve the internal noise criteria for bedrooms and living areas.

At this site, the facade performance requirements are driven by the night-time maximum noise levels. The facade specification has been determined to ensure that $L_{AFmax\ 2\ min}$ criteria is exceeded on no more than 10 occasions based on the worst affected night during the survey.

R'_w+C_{tr} 30 dB will be achievable with a double-glazing system, for example 8 mm glass/16 mm cavity/6 mm glass.

9 Conclusion

The 10th highest night-time maximum noise levels measured during the survey were L_{AFmax} 58 dB internally and L_{AFmax} 80 dB externally. The average noise levels during the daytime period were $L_{Aeq,16h}$ 48 dB internally and $L_{Aeq,16h}$ 68 dB externally and during the night-time period the levels were $L_{Aeq,8h}$ 37 dB internally and $L_{Aeq,8h}$ 63 dB externally.

The internal noise levels measured do not meet the RBKT noise ingress criteria and, as such, the windows will need to be replaced. The external noise levels measured indicates that openable windows cannot be used to provide ventilation and still meet the internal noise criteria.

The minimum recommended window sound insulation performance to achieve the internal noise level for bedrooms / living rooms is R'_w+C_{tr} 30 dB.

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Appendix A

Survey details

Equipment

Both the unattended noise measurements were taken using a 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-52/00264531	Rion	5 Jul 24	TCRT22/1430
Microphone	UC-59/09678	Rion	5 Jul 24	TCRT22/1430
Pre-amp	NH-25/64656	Rion	5 Jul 24	TCRT22/1430
Calibrator	NC-75/35013664	Rion	5 Jul 24	TCRT22/1427
Sound level meter	NL-52/00375679	Rion	19 Jul 23	TCRT21/1501
Microphone	UC-59/11168	Rion	19 Jul 23	TCRT21/1501
Pre-amp	NH-25/65806	Rion	19 Jul 23	TCRT21/1501
Calibrator	SV30A/10576	Svan	16 Jul 23	TCRT21/1500

Calibration of the meters used for the measurements is traceable to national standards. Calibration certificates for the sound level meters 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 -3°C at night and 15°C during the day, and the wind speed was less than 6 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at Location A

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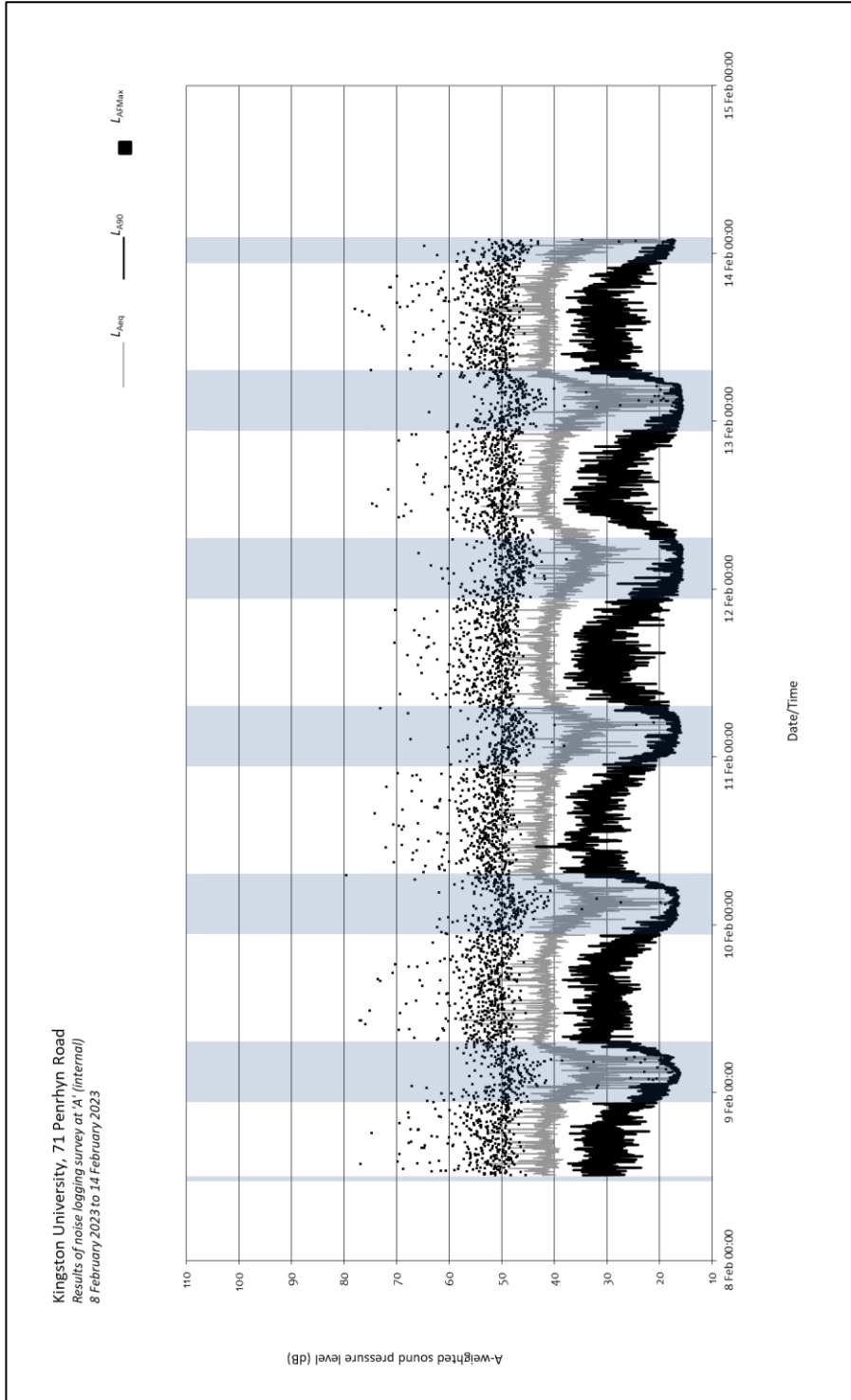


Figure B1 Results of internal unattended measurements

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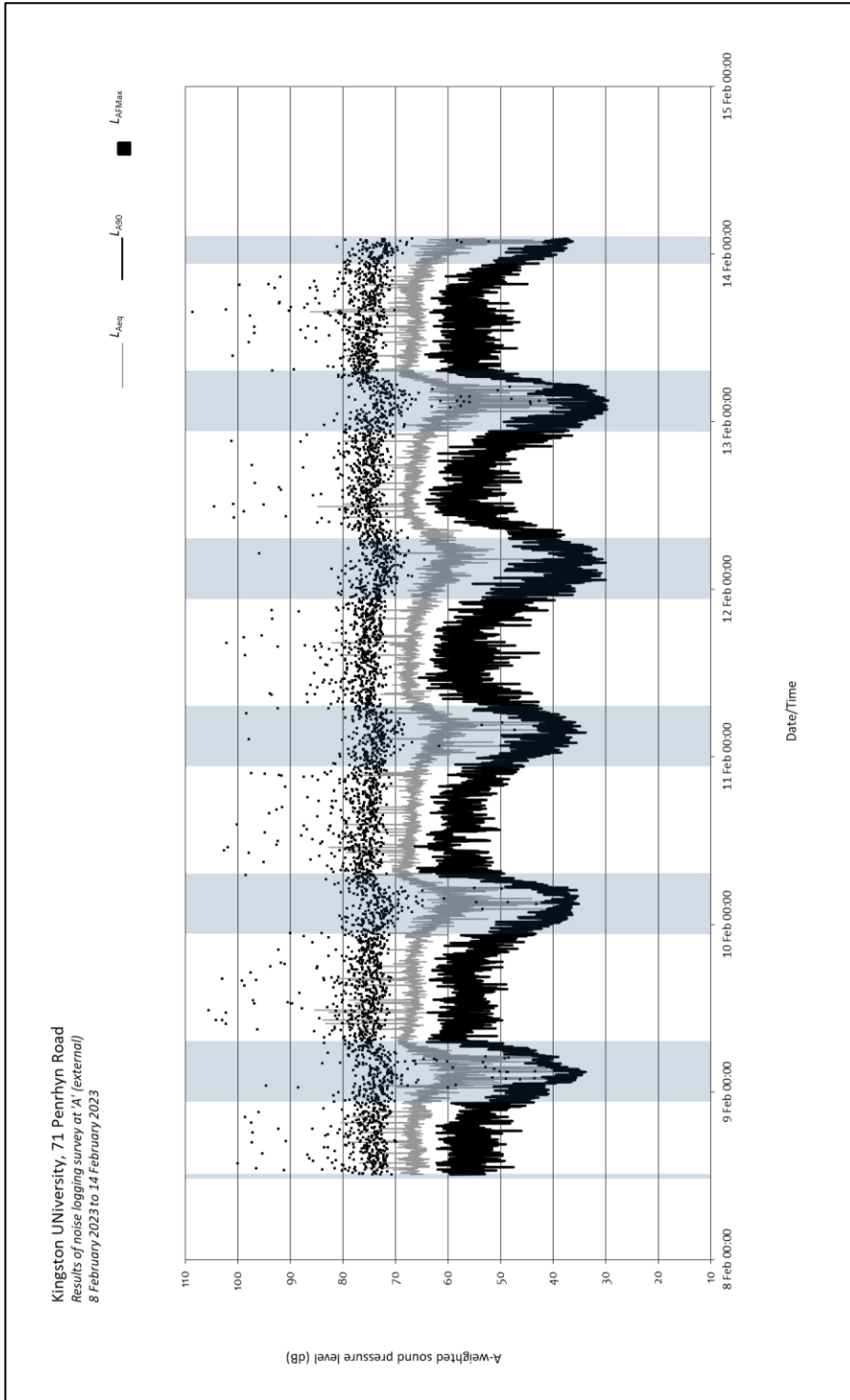


Figure B2 Results of external unattended measurements