SANDY BROWN

Consultants in Acoustics, Noise & Vibration

16529-R01-D

17 March 2021

Brunswick Street, Manchester

Acoustic planning report

London, Manchester, Edinburgh, Birmingham, Belfast

post@sandybrown.com
www.sandybrown.com

Sandy Brown Associates LLP
Registered in England & Wales No. OC 307504 Registered Office: 55 Charterhouse Street, London EC1M 6HA

Version	Date	Comments	Author	Reviewer
A	14 Dec 16		James Atha	Helen Sheldon
B	19 Dec 16	Minor amendment to use of ground floor space	Helen Sheldon	Mark Howarth
C	9 May 17	Minor amendments	Al Plail	James Atha
D	17 Mar 21	Updated massing	Daniel Shaw	James Atha

Disclaimer

This report has been prepared for the sole benefit and use of our client based on their instructions and requirements. Sandy Brown Associates LLP extends no liability in respect of the information contained in the report to any third party.

Summary

Sandy Brown has been commissioned Brunswick Living Limited to provide acoustic advice in relation to the proposed development at Brunswick Street in Manchester.

An environmental noise survey was performed between 7 and 9 December 2016.

The representative background sound levels measured during the survey were $L_{A90,15min}$ 54 dB during the daytime and $L_{A90,15min}$ 51 dB at night. Based on the requirements of Manchester City Council and on the results of the noise survey, all plant must be designed such that the cumulative noise rating levels (BS4142:2014) at 1 m from the worst affected windows of the nearby noise sensitive premises do not exceed L_{Aeq} 49 dB during the daytime and L_{Aeq} 46 dB during the night.

3D noise modelling has been carried out to predict the environmental noise levels outside the facades of the residential apartments. The predicted facade noise levels outside the noisiest facade were L_{Aeq} 70 dB during the daytime and L_{Aeq} 67 dB at night. Based on the modelling results and the requirements of MCC, minimum sound insulation performances have been recommended for the apartments.

Outline advice on facade constructions and ventilation strategies have also been provided. This indicates that the apartments located on the Brunswick Street facade will require a mechanical ventilation strategy in combination with high performance acoustic double glazing whereas it would be possible to utilise standard thermal double glazing in combination with acoustically rated ventilators for living rooms towards the rear of the development.

Contents

1 Introduction 5
2 Site description 6
3 Method 7
4 Measurement results 7
5 Assessment criteria 10
6 Plant noise egress 12
7 Facade sound insulation – noise ingress 13
8 Conclusion 18
Appendix A 19
Survey details 19

1 Introduction

Sandy Brown has been commissioned by Brunswick Living Limited to provide acoustic advice in relation to the proposed development at Brunswick Street in Manchester.

An environmental noise survey has been carried out, the purpose of which was to establish the existing ambient and background sound levels in the vicinity of the site and nearby noise sensitive premises.

The background sound levels measured during the survey are used as the basis for setting limits for noise emissions from proposed building services plant. The limits for noise egress are set in accordance with the requirements of Manchester City Council. The facade sound insulation is assessed in order to determine the necessary performance required to achieve appropriate internal noise levels for residences set in accordance with Manchester City Council's requirements.

This report presents the noise survey methods, the results of the survey, a discussion of acceptable limits for noise emission from building services plant and minimum sound insulation requirements for the building envelope.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 1. The position of the site is outlined in red. It is located on Brunswick Street close to the roundabout between two busy main roads, the A57 and the A6. The development is proposed to be a five storey apartment building with ground floor resident's lounge and private garden.



Figure 1 Site map (courtesy of Google Earth Pro)

2.2 Adjacent premises

To the north of the site is a Tesco Petrol Station and to the southwest of the site is an NHS Building known as The Vallance Centre.

There is a construction site on the opposite side of Brunswick Street where a new residential building known as Polygon Street is currently under construction. Beyond this is the Manchester Apollo venue which regularly hosts concerts which include loud amplified music.

3 Method

Details of the equipment used, the noise indices and the weather conditions during the survey are provided in Appendix A. Further information on the specific survey method is provided in this section.

Attended sample measurements were performed by Jose Maria Gonzalez Diaz at three locations around the site. These are indicated in Figure 1 as positions 1 to 3. The measurements were carried out on 6 to 9 December 2016, with the purpose of determining the existing noise levels from road traffic, pedestrians and other significant noise sources in the area.

The daytime measurements were carried out over 15 minute periods. Some of the night-time measurements were carried out over shorter 5 minute periods to collect additional night-time maxima data for the site.

In each case the microphone was mounted on a tripod approximately 1.5 m above the ground level and at least 1 m from any other reflective surface. The measurements are considered to be facade measurements.

The evening measurements carried out the site were during a rock concert at the nearby Manchester Apollo venue to capture a worst case period in terms of noise.

4 Measurement results

The dominant noise sources observed at the site during the survey consisted of road traffic and emergency sirens from the A6 and the A57, Brunswick Street, and the nearby the roundabout. A HGV delivery also occurred at Tesco during the measurement at 02:03 at position 3.

Less significant noise sources included faintly audible amplified sound egress from Manchester Apollo during quiet periods of road traffic (during evening measurements), the audible signal beeping at the pedestrian crossing, plant noise from Tesco petrol station, birdsong, car doors slamming, pedestrian activity.The sound pressure levels recorded during the attended measurements are summarised in Table 1. The dominant noise sources noted during the measurements are also described in Table 1. All measurements were carried out over 15 minute periods unless noted otherwise. Measurements were carried out in the free field.

Table 1 Sound pressure levels from measurements

Position	Start time	Sound pressure levels (dB)			Noise sources
		L_{Aeq}	L_{AFmax}	L_{A90}	
1	13:25	76	102	65	Road traffic noise (RTN) from A57 and A6, RTN from Brunswick St, pedestrian crossing audible signal beeping, occasional construction noise and faint constant generator noise from site opposite, pedestrian activity, emergency sirens (13:25), car horn (13:40, 15:10, 15:47), car horn (13:55), piling from construction site opposite (14:10).
	13:40	71	96	65	
	13:55	80	105	64	
	14:10	69	82	63	
	14:25	69	83	63	
	14:40	69	89	63	
	14:55	69	87	63	
	15:10	72	97	63	
	15:25	68	83	63	
	15:40	79	105	64	
	15:55	69	80	64	
	16:10	71	93	64	
	20:17	68	82	61	RTN, pedestrian activity, pedestrian crossing audible signal beeping.
	21:10	68	79	60	
	22:45 [1]	69	88	63	RTN, pedestrians activity, people leaving the concert at the Apollo, pedestrian crossing audible signal beeping, car horns, emergency siren (22:55).
	22:50 [1]	68	82	64	
	22:55 [1]	72	94	62	
	23:00 [1]	67	79	61	
	23:05 [1]	66	75	60	
	23:10 [1]	66	75	59	
	23:49 [1]	65	76	58	RTN, pedestrians passing by talking, car door slam, emergency siren (00:39), distant plant noise, bird song.
	23:54 [1]	64	76	55	
	23:59 [1]	65	77	55	
	00:39	70	101	55	
	01:31	63	80	52	

Position	Start time	Sound pressure levels (dB)			Noise sources
		L_{Aeq}	L_{AFmax}	L_{A90}	
2	16:27	64	87	59	RTN, pedestrian crossing, faint low frequency music noise from Apollo during quiet periods of evening measurements, distant car door slams and horns, petrol station activity, distant plant noise, bird song.
	20:37	63	73	60	
	21:27	63	80	59	
	23:17 [1]	63	69	60	
	23:22 [1]	64	73	61	
	23:27 [1]	62	71	59	
	00:06 [1]	62	69	58	
	00:11 [1]	63	74	59	
	00:16 [1]	62	70	56	
	00:56	61	72	55	
	01:47	61	74	56	
3	16:43	57	78	54	RTN, faint plant noise from Tesco (screened), distant car alarm, car and pedestrian activity at petrol station, car idling (23:33)
	20:53	59	85	59	
	21:42	59	70	59	
	23:33 [1]	59	69	54	
	23:38 [1]	58	68	54	
	23:43 [1]	58	68	52	
	00:22 [1]	58	68	53	RTN, faint plant noise from Tesco (screened), bird song, car door slam, aircraft pass overhead (00:28), HGV unloading deliver to Tesco (02:03) approximately 5 m from measurement position.
	00:27 [1]	59	70	52	
	00:32 [1]	57	68	51	
	01:15	57	76	51	
	02:03	62	83	51	

[1] 5 minute measurement period taken to collect additional L_{Amax} data.

The lowest background sound levels measured during the survey were L_{A90} 51 dB during the night and L_{A90} 54 dB during the daytime at position 3. The octave band background sound levels associated with these measurements are given below in Table 2.

Table 2 Octave band background sound levels, L_{90} (dB)

Time of day	Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Daytime (07:00 – 23:00)	65	56	53	48	49	45	37
Night time (23:00 – 07:00)	58	52	52	46	46	42	30

The expected night-time maximum values not normally exceeded are provided in Table 3 below

Table 3 Night-time maximum noise level summary

Measurement position	Expected night-time maximum sound pressure level not normally exceeded, L_{Amax} (dB)
1	80
2	74
3	70

5 Assessment criteria

5.1 NPPF and NPSE

The National Planning Policy Framework (NPPF) sets out the government planning requirements, and supersedes previous guidance notes such as PPG24. No specific noise criteria are set out in the NPPF, or in the Noise Policy Statement for England (NPSE) to which it refers.

The NPPF states:

'Planning policies and decisions should aim to:

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.'*

The NPSE states that its aims are as follows:

'Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life.'*

As such, although neither of these documents sets out specific acoustic criteria for new residential development, the requirement to control both the effect of existing noise on the new development and the effect of noise from the development on the surroundings needs to be considered.

5.2 Plant noise egress

5.2.1 Standard guidance

Guidance for noise emission from proposed new items of building services plant is given in BS 4142: 2014 '*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 the nearest noise sensitive.

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.

5.2.2 Local Authority criteria

Manchester City Council (MCC) stipulates the following criteria in their Noise and Planning Guidance in regards to plant noise emissions:

> *"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 (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location"*

Appropriate corrections will need to be made for any attention catching features in line with BS 4142: 2014.

5.3 Internal noise levels – noise ingress

The Manchester City Council *Planning & Noise Technical Guidance* document dated December 2015 section 3.6.1.1, sets the internal noise limits given in Table 4 for residential developments.

Table 4 Manchester City Council internal noise criteria for residential developments

Internal space	Internal noise level L_{Aeq} (dB)	
	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Living rooms	35	-
Bedrooms	-	30

The following limits are also stipulated:

- Individual noisy events should not normally exceed L_{Amax} 45 dB within bedrooms more than 15 times during the night
- Music noise levels from entertainment venues should be controlled to achieve limits of 47 dB at 63 Hz and 41 dB at 125 Hz (L_{eq}) in octave bands within habitable rooms.

The levels in Table 4 are the cumulative noise levels to be achieved by external noise ingress in combination with any noise from mechanical ventilation systems.

6 Plant noise egress

6.1 Limits

Based on the above criteria and the measurement results, the cumulative noise rating level (BS4142:2014) resulting from the operation of all new plant at 1 m from the worst affected windows of the nearest noise sensitive premises should not exceed the limits set out in Table 5.

Table 5 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum cumulative plant noise rating level (BS4142:2014) at 1 m from nearby noise sensitive premises (dBA)
07:00-23:00	49
23:00-07:00	46

The limits set out in Table 5 do not include any attention catching features. The penalties for attention catching features may be significant, and will need to be considered as the building services design progresses in line with BS4142:2014.

6.2 Assessment

At this stage, no information is available in relation to the proposed installation of building services plant, and this will need to be assessed in detail as the design progresses. However, all plant items will be designed to achieve the plant noise limits set out above, including any corrections for attention catching features.

7 Facade sound insulation – noise ingress

This section discusses internal noise level criteria and assesses the required facade sound insulation performance. In principle, the required facade specification depends on two factors – the external noise levels at the site, and the internal noise criteria.

The following assessment is based on achieving the internal noise levels recommended by Manchester City Council, which are set out in Section 5.3.

7.1 3D noise modelling

A 3D computer model of the site and its surroundings has been generated using CadnaA (version 4.6) software by Datakustik. This allows for an assessment of noise ingress by incorporating the screening that proposed buildings will provide when completed.

The software carries out calculations using a ray tracing technique. This takes account of the effects of topography, reflections, screening and distance attenuation for noise sources to predict noise levels in three dimensions. Calculations are carried out in accordance with ISO 9613 "*Attenuation of sound during propagation outdoors".*

The 3D noise model has been based on the following information:

- Design drawings received 11 March 2021
- The noise survey measurements
- Geometry for 'The Polygon Building' on the opposite site has also been included in the model based on Google Earth images of the building under construction.

An image from the noise model is provided in Figure 2.

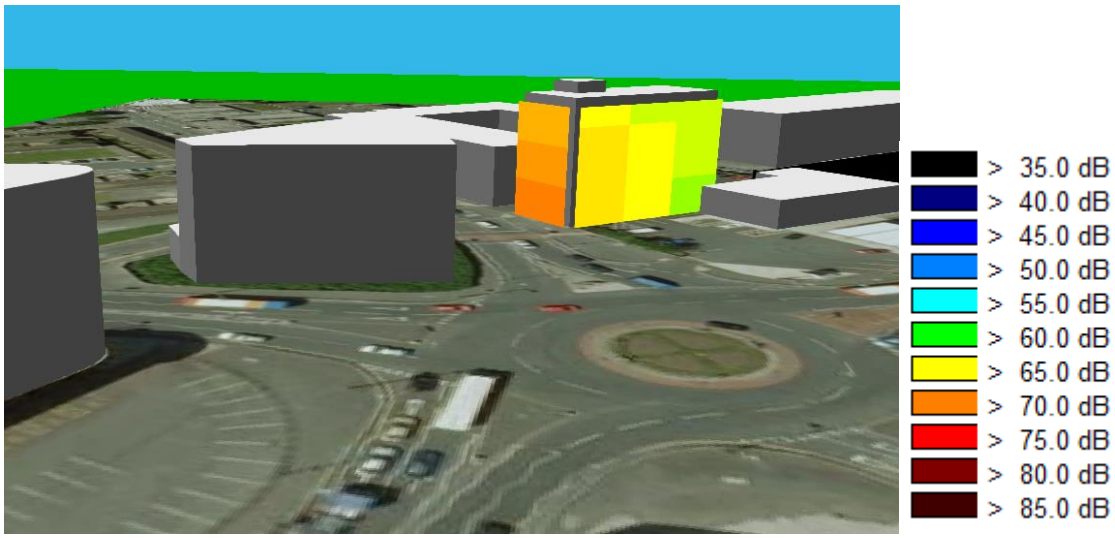


Figure 2 Image from 3D noise model – Daytime noise levels East view

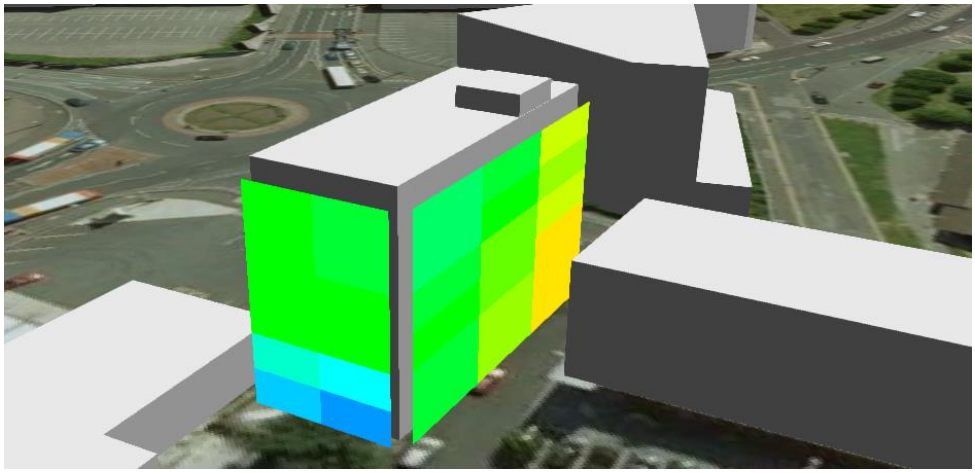


Figure 3 Image from 3D noise model – Daytime time noise levels West view

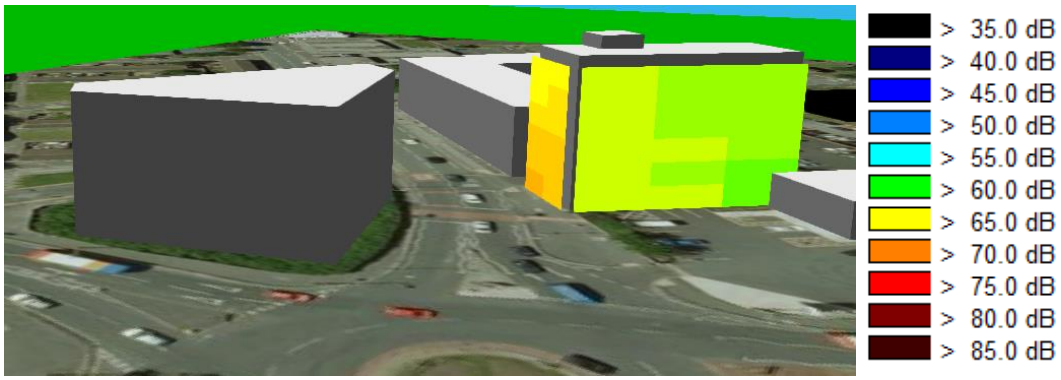


Figure 4 Image from 3D noise model – Night-time noise levels – East view

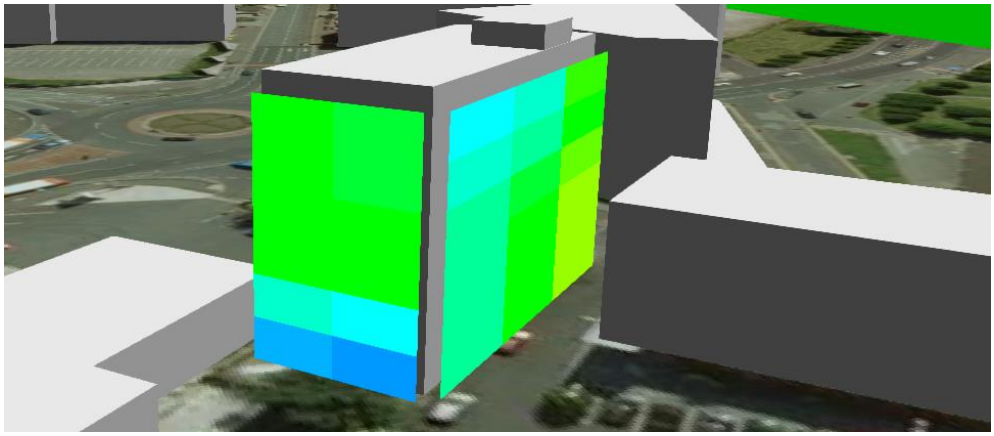


Figure 5 Image from 3D noise model – Night-time noise levels – West view

7.2 Facade sound insulation

To achieve the internal noise criteria given in section 5.3 for bedrooms and other living areasthe minimum recommended facade sound insulation requirements have been determined, based on the predicted external noise levels from the 3D modelling.

The minimum recommended sound insulation performances for the different building facades are given in Table 6. These are driven by the ambient noise levels as the maximum 'not normally exceeded' levels as the maximum levels are less than 15 dB greater than the ambient levels.

Table 6 Facade sound insulation performance requirements

Facade zone/ key to mark-ups	Overall minimum recommended sound insulation performance R'_w+C_{tr} (dB)
A	39
B	36
C	31
D	25

These minimum recommended performances correspond to the mark-ups given below.

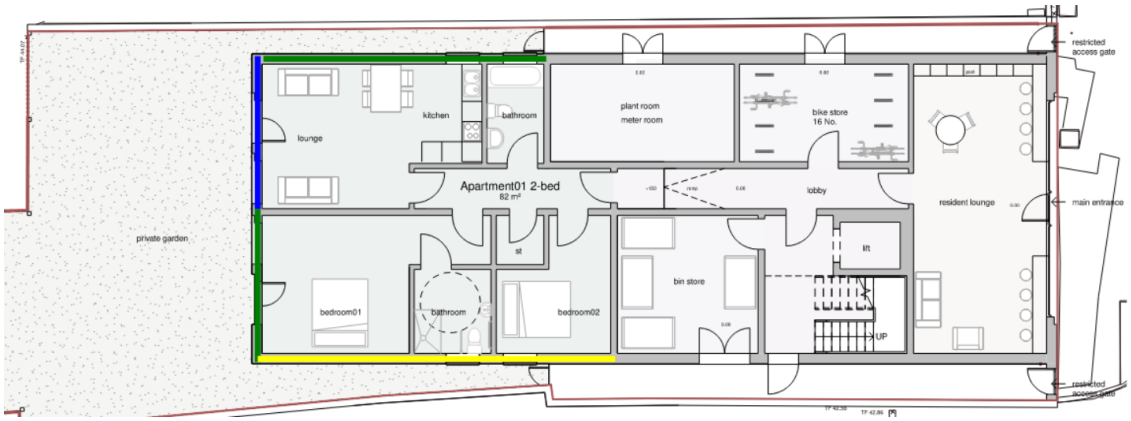


Figure 6 Ground floor level – recommended minimum facade sound insulation performance

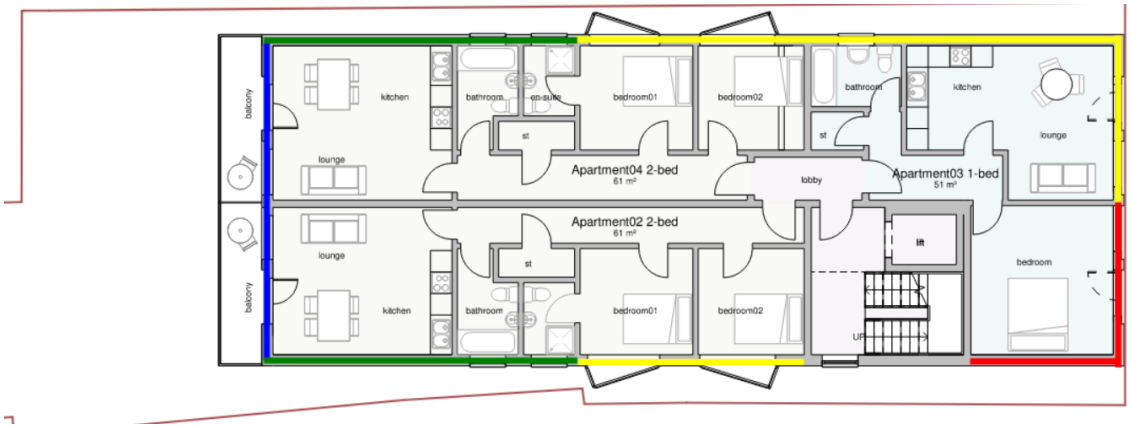


Figure 7 Levels 1, 2, 3, 4 – recommended minimum facade sound insulation performance

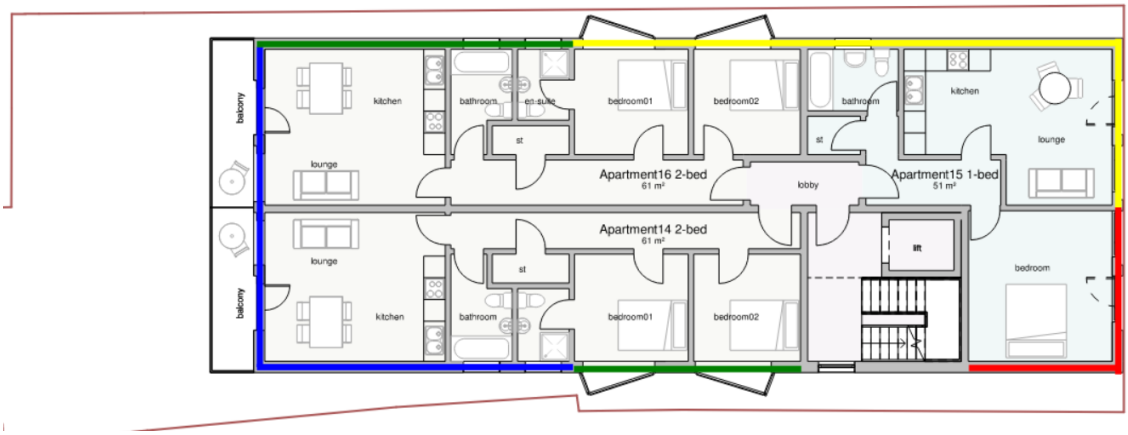


Figure 8 Level 5 – recommended minimum facade sound insulation performance

7.2.1 Guidance on facade construction, glazing, and ventilation strategy

The required performance for the glazing rather than the facade as a whole will depend on the relative areas of each element. For example, a window for 50% of the facade area will require a sound insulation performance 3 dB lower than that of the facade as a whole, assuming the solid elements provide a performance at least 10 dB greater.

The following table sets out some examples of glazing build ups and ventilation strategies that could be employed to achieve the required sound insulation performance for the various elevations. These are for the worst case areas where areas of glazing are significant.

Table 7 Example glazing configurations and ventilation strategies

Sound insulation $R'_w + C_{tr}$ (dB)	Example glazing configuration	Ventilation Strategy
25	6 mm/12 mm/6 mm	Attenuated passive ventilation (eg, trickle vents)
31	6.4 mm/12 mm/6 mm	Attenuated passive ventilation
36	12.8 mm/12 mm/10 mm	Mechanical ventilation (eg, whole house ventilation)
39	12.8 mm/20 mm/10 mm	Mechanical ventilation (eg, whole house ventilation)

The performance required by each element will depend on the construction of the solid elements, the glazing specification, the relative areas of the solid and glazed elements, and the ventilation strategy (including the acoustic performance of the trickle ventilators and the number of ventilators required to serve individual rooms, if applicable).

As the design progresses, a more detailed facade sound insulation assessment will need to be performed, taking into account the factors listed above, to ensure that the overall performance requirements will be met.

8 Conclusion

An environmental noise survey has been carried out at the site.

The minimum measured background sound levels were $L_{A90,15min}$ 54 dB during the day, and $L_{A90,15min}$ 51 dB during the night. On the basis of the requirements of the Local Authority, the relevant plant noise rating limits (BS4142:2014) at the worst affected existing noise sensitive premises would be 49 dB during the day, and L_{Aeq} 46 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, appropriate corrections will need to be applied.

3D noise modelling has been carried out to predict the environmental noise levels outside the facades of the residential apartments. Based on this and the requirements of MCC, minimum sound insulation performances have been recommended for the apartments. Outline advice on facade constructions and ventilation strategies have also been provided.

Appendix A

Survey details

Equipment

A Rion NL-52 sound level meter was used to undertake the measurements. The 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	NL52/00932326	Rion	24 Feb 17[1]	1502114
Microphone	UC59/05549	Rion	24 Feb 17[1]	1502114
Pre-amp	NH25/32354	Rion	24 Feb 17[1]	1502114
Calibrator	NC74/34125432	Rion	24 Feb 17[1]	1502110

[1] Equipment calibration had not expired at the time of the survey.

Calibration of the sound level meters 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 meters and microphones were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

Noise indices

The equipment was set to record a continuous series of broadband sound pressure levels. 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 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.

The L_{A90} is considered most representative of the background sound level for the purposes of complying with any local authority requirements.

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 measurements, the weather was generally clear and dry and no rain occurred. The wind speed was measured to be less than 3.5 m/s during the daytime and there was no wind during the night-time measurements. The temperature was measured to be 15^{o}C during the daytime measurements and 8^{o}C at night.

These weather conditions are considered suitable for obtaining representative measurements.