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CARPENTERS ARMS, 105 KING'S CROSS ROAD, LONDON

NOISE IMPACT ASSESSMENT

Report 13234.NIA.01 Rev C

Prepared on 24 May 2016

For:

Golfrate Property Management Ltd

177-187 Arthur Road

Wimbledon

London

SW19 8AE

Site Address	Report Date	Revision History
Carpenters Arms 105 King's Cross Road London WC1X 9LR	09/10/2015	Rev A – 12/05/2016 Rev B – 19/05/2016 Rev C – 24/05/2016

Contents

List of Attachments

1.0 INTRODUCTION

KP Acoustics has been commissioned by Golfrate Property Management Ltd, 177-187 Arthur Road, Wimbledon, London, SW19 8AE, to assess the suitability of the site at 105 King's Cross Road, London, WC1V 9LR, for residential development in accordance with the provisions of the National Planning Policy Framework and the Noise Policy Statement for England (NPSE).

Proposals involve the retention of the Ground Floor bar, the conversion of the First and Second Floors to 2 No. residential Flats, and a proposed Third floor extension with 1 No. Flat.

This report presents the results of the environmental survey undertaken in order to measure prevailing background noise levels and outlines any necessary mitigation measures.

2.0 ENVIRONMENTAL NOISE SURVEY

2.1 Procedure

A noise survey was undertaken at the proposed site as shown in Figure 13234.SP1. The location was chosen in order to collect data representative of the worst-case levels expected on the site due to all nearby sources.

Continuous automated monitoring was undertaken for the duration of the survey between 11:11 on 6th October 2015 and 11:00 7th October 2015.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise.

The measurement procedure generally complied with ISO 1996-2:2007 Acoustics "*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*".

2.2 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 958 Class 1 Sound Level Meter
- B&K Type 4231 Class 1 Calibrator

3.0 RESULTS

3.1 Noise Survey

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time history in Figure 13234.TH1. Average daytime and night time noise levels are shown in Table 4.1.

4.0 DISCUSSION

The site is bounded by King's Cross Road to the East, Frederick Street to the South, Acton Street and railway lines to the North, and existing commercial and residential properties to the North. At the time of the survey, the background noise climate was solely dominated by road traffic noise from the surrounding roads, and rail traffic noise from the nearby railway lines.

Measured noise levels are representative of noise exposure levels expected to be experienced by all façades of the proposed development.

	Level dB(A)
Position 1 – East Façade, Overlooking King's Cross Road	
Daytime $L_{Aeq,16hour}$	67
Night-time $L_{Aeq,8hour}$	64

Table 4.1 Site average noise levels for daytime and night time

5.0 NOISE IMPACT ASSESSMENT

5.1 Noise Assessment

Internal noise requirements are normally based on BS8233:2014 '*Guidance on sound insulation and noise reduction for buildings*'. This standard recommends internal noise levels for good or reasonable resting conditions during daytime (07:00-23:00 hours) and night-time (23:00-07:00). These levels are shown in Table 4.1.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB(A)	-
Dining	Dining Room/area	40 dB(A)	-
Sleeping (daytime resting)	Bedrooms	35 dB(A)	30 dB(A)

Table 5.1 BS8233 recommended internal background noise levels

The external building fabric would need to be carefully designed to achieve these recommended internal levels. It is understood that the non-glazed external building fabric elements of the development would be comprised of masonry. This would contribute towards a significant reduction of ambient noise levels in combination with a good quality double-glazed window configuration, as shown in Section 6.

6.0 EXTERNAL BUILDING FABRIC SPECIFICATION

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed and non-glazed elements in order to achieve 'good' internal noise levels shown in Table 5.1, taking into account average and maximum noise levels monitored during the environmental noise survey, and worst case manual noise measurements of the kitchen extraction flue.

Bedroom 1 of Flat 5 has been used for the glazing calculations, due to the high ratio of glazing to masonry.

As a more robust assessment, L_{Amax} spectrum values of night-time peaks have also been considered and incorporated into the glazing calculation in order to cater for the interior limit of 45 dB L_{Amax} for individual events, as specified in BS8233:2014.

6.1 Non-Glazed Elements

All non-glazed elements of the building façade have been assumed to provide a sound reduction performance of at least the figures shown in Table 6.1 when tested in accordance with BS EN ISO, 140-3:1995.

Element	Octave band centre frequency SRI, dB					
	125	250	500	1k	2k	4k
Non glazed element SRI	41	43	48	50	55	55

Table 6.1 Non-glazed elements assumed sound reduction performance

6.2 Glazed Elements

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in Table 6.2. The performance is specified for the whole window unit, including the frame and other design features such as the inclusion of trickle vents. Sole glass performance data would not demonstrate compliance with this specification.

Glazing performance calculations have been based both on average measured night-time noise levels as well as verified against the L_{Amax} spectrum of individual events in order to comply with a maximum internal noise level of 45dB(A) in bedrooms as recommended by BS8233. The combined most robust results of these calculations are shown in Table 6.2.

Glazing Type	Octave band centre frequency SRI, dB					
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
All Elevations	24	30	34	40	37	28

Table 6.2 Required glazing performance

With regards to the introduction of acoustic trickle vents, we would recommend any system with a rated acoustic performance of 43-45 dB, $D_{n,e,w}$, should natural ventilation be required. Alternatively, we would recommend the use of mechanical ventilation.

All major building elements should be tested in accordance with BS EN ISO 140-3:1995.

Independent testing at a UKAS accredited laboratory will be required in order to confirm the performance of the chosen system for an “actual” configuration.

No further mitigation measures would be required to achieve good internal noise levels.

7.0 INTERNAL BUILDING FABRIC SPECIFICATION

7.1 Sound Insulation Investigation

Based on the proposals of the conversion of the upper floors to residential units, a sound insulation investigation has been undertaken in order to measure the existing airborne sound insulation performance of the separating floor, provide noise break-in calculations, and recommendations which could be adopted to the separating floor as required.

High volume “pink” noise was generated from two loudspeakers in the source room (Ground Floor Bar), positioned to obtain a diffuse sound field. A spatial average of the resulting one-third octave band noise levels between 100 Hz and 3150 Hz was obtained by using a moving microphone technique over a minimum period of 15 seconds at each of two positions.

The same measurement procedure was used in the receiver room (First Floor Living space and kitchen).

Note that the use of pink noise was to provide a robust assessment in generating high levels of low frequency content, similar to those expected from live music.

The results of the tests were rated in accordance with BS EN ISO 717-1: 1997 “Rating of sound insulation in buildings and of building elements. Part 1 Airborne sound insulation”.

Reverberation time measurements were taken following the procedure described below in order to correct the receiver levels for room characteristics.

The source was moved to the receiver room and "pink" noise was generated and stopped instantaneously in order to measure the reverberation time in each of the one-third octave bands between 100 Hz and 3150 Hz. The internal programme of the meter was used to measure the decay time of the sound in the room. This was repeated six times in the receiver room in order to obtain an average result.

The background noise levels in the receiver room was measured during the tests and the receiving room levels corrected in accordance with BS EN ISO 140-4:1998 and BS EN ISO 140-7:1998.

The dominant source of background noise observed during the tests was road traffic noise from King's Cross Road.

The instrumentation used during testing is shown in Table 7.1 below.

Instrument	Manufacturer and Type	Serial Number
Precision integrating sound level meter & analyser	01dB-Sell Blue Solo Calibration No: 01244/2 Calibration Date 20th March 2015	60065
Active Loudspeaker	RCF ART 310A	KLXF29324
Active Loudspeaker	RCF ART 310A	HAX20864
Pink Noise Source	NTi Audio Minirator MR-PRO	G2P-RACDR-G0
Pink Noise Source	NTi Audio Minirator MR-PRO	G2P-RABTR-F2
Calibrator	B&K Type 4231 Calibration No: 01703/1 Calibration Date 20th March 2015	1897774
Specialist Software	01dB-Metravib dBBati	V5.2
Tapping machine	Sound Solutions Series 2 Calibration No: 01244/1 Calibration Date 23rd March 2015	TP02059

Table 7.1 Instrumentation used during testing

The results of testing are summarised in Table 7.2 below. For airborne tests, the higher the value, the better the performance.

Test Element	Source	Receiver	Test Result
Floor	Ground Floor Bar	First Floor Living space	$D_{nT,w} + C_{tr}$ 38dB
Floor	Ground Floor Bar	Kitchen	$D_{nT,w} + C_{tr}$ 38dB

Table 7.2 Airborne Test Results

7.2 Noise Break-In Assessment

In order to assess potential noise break-in from the Ground Floor Bar to the Flats above, a worst case scenario of live music within busy bar environment would be considered.

Furthermore, as the bar would be open until 1am from Monday to Thursday, 01:30am on Friday and Saturdays, and 00:00am on Sundays, it should be ensured that the floor system provides a high level of sound insulation in order to ensure the amenity of the proposed residents is protected during the public house operating hours.

Using a worst case source level 90 dB(A) to take into account a busy bar environment and live music, and taking into account the measured $D_{nTw} + C_{tr}$ rating of the separating floor, Table 7.3 shows predicted sound pressure levels within the First Floor residential spaces due to activity within the Ground Floor Bar. Detailed calculations are shown in Appendix B.

Receivers	BS8233 Night-time Noise Criterion (23:00-07:00)	Noise Level Inside Flats
First Floor Receiver	30 dB(A)	48 dB(A)

Table 7.3: Predicted noise level within first floor flats at present

The predicted break-in noise levels have been compared with the design criterion of BS8233:2014 '*Guidance on sound insulation and noise reduction for buildings*'. This standard recommends good internal noise levels for resting conditions during night-time (23:00-07:00 hours) of 30dB(A).

Based on the calculated noise break-in levels from the Ground Floor bar, upgrade measures would need to be adopted to the separating floor in order to achieve an internal noise level of below 30dB(A) to protect the amenity of the residents above.

7.3 Proposed Upgrade Measures

It is understood that the floor at present is comprised of a timber joist system. In order to address the airborne sound insulation for the single joist system, we would recommend the following:

- Removal of all current floorboards within the First Floor
- Installation of 2x50mm CMS QuietSlab (density 60kg/m^3), separated with polymeric mass barrier (mass 10kg/m^2) within the joist void
- Direct fixing of 1x18mm Versapanel cementitious board, on the joists

- 45mm timber battens with 10mm Regupol 6010SH installed to the underside, as a floating layer with 25mm mineral wool (60kg/m^3 density) within the formed void
- 1x18mm Versapanel cementitious board on the battens as the end decking. This layer can then accommodate the end walking surface
- RB-1 resilient bar installed to the underside of the existing ceiling, with 2x15mm Fermacell plasterboard as the new ceiling lining within the bar space

General Advice

For airborne sound insulation, special attention should be given to workmanship regarding the proper sealing of junctions and penetration details. Where any gaps between external (flanking) walls and floors exist, they should be caulked with sealant or similar type material. It should be also noted that flanking strips (Yelofon ES5/100) should be installed around the perimeter of the floor to isolate the floor from walls and skirtings. The strip should be turned up so that the skirting boards rest on them and any excess cut away.

Ideally, a gap between the head of the wall and the underside of the soffit should not be greater than 10mm. A polyethylene backing rod could be inserted in the gap with tightly packed mineral wool while silicone caulk is used to seal the joint.

In the case of any new walls, isolation strips would need to be used, which would isolate the wall leaves from the sub-floor, therefore minimising any flanking paths. Please note that a material such as Monarfloor or Regupol Isolation Strip can be used to isolate any new walls built on any steel structure.

Chimney breasts which bridge two or more separate dwellings should be bricked up in order to stop any flanking of noise via the cavity. The section directly adjacent to the separating floor should be completely filled and any gaps sealed with non-setting mastic of packed with mineral wool. Should the use of bricks not be desired, we would recommend the pattressing of the fireplace by two layers of 15mm SoundBloc with proper sealing of the junctions with non-setting mastic. The installation of a blockage at right angles to the direction of the chimney shaft would also be recommended. We would suggest the installation of a layer of SuperLag Quietslab. This is a sandwich system which is comprised of two 50mm layers of compressed high-density mineral wool slabs (60kg/m^3) separated by a 10kg/m^2 heavy PVC film.

Using a worst case source level 90 dB(A) to take into account a busy bar environment and live music, and taking into account the measured $D_{nTw} + C_{tr}$ rating of the upgraded separating floor as outlined in Section 7.3, Table 7.4 shows predicted sound pressure levels within the First Floor residential spaces due to activity within the Ground Floor Bar. Detailed calculations are shown in Appendix B.

Receivers	BS8233 Night-time Noise Criterion (23:00-07:00)	Noise Level Inside Flats
First Floor Receiver	30 dB(A)	30 dB(A)

Table 7.4: Predicted noise level within first floor flats with upgrade measures

8.0 CONCLUSION

An environmental noise assessment has been undertaken at 105 King's Cross Road, London. Measured noise levels have allowed the proposal of a robust glazing specification, which would provide internal noise levels for all residential environments of the development commensurate to "Good" in the design range of BS8233.

The mitigation measures described would be sufficient to protect the proposed residential properties from external noise intrusion, and to achieve internal noise conditions for the residents which would be commensurate to all current Standards.

An additional noise break-in assessment has been undertaken based on the exiting airborne sound insulation performance of the separating floor, which shows that upgrade measures would need to be adopted to protect the amenity of the First Floor residents from activity within the Ground Floor bar area. Upgrade solutions for the floors have been proposed which would provide internal noise levels for all residential environments of the development commensurate to the design range of BS8233, and Building Regulations requirements

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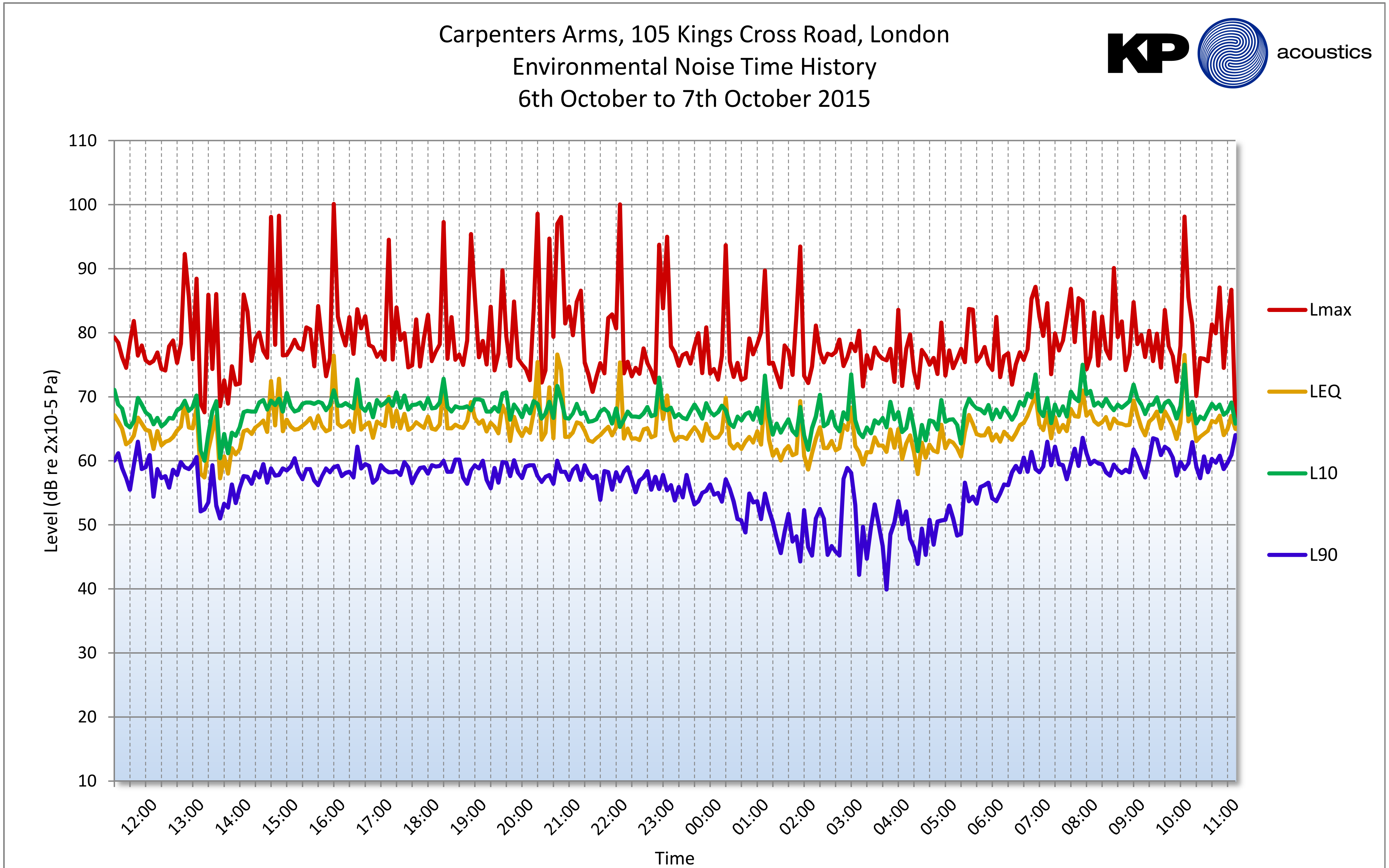

Figure 13234.TH1

Title:

Indicative site plan showing noise monitoring position

Date: 9 October 2015

FIGURE 13234.SP1

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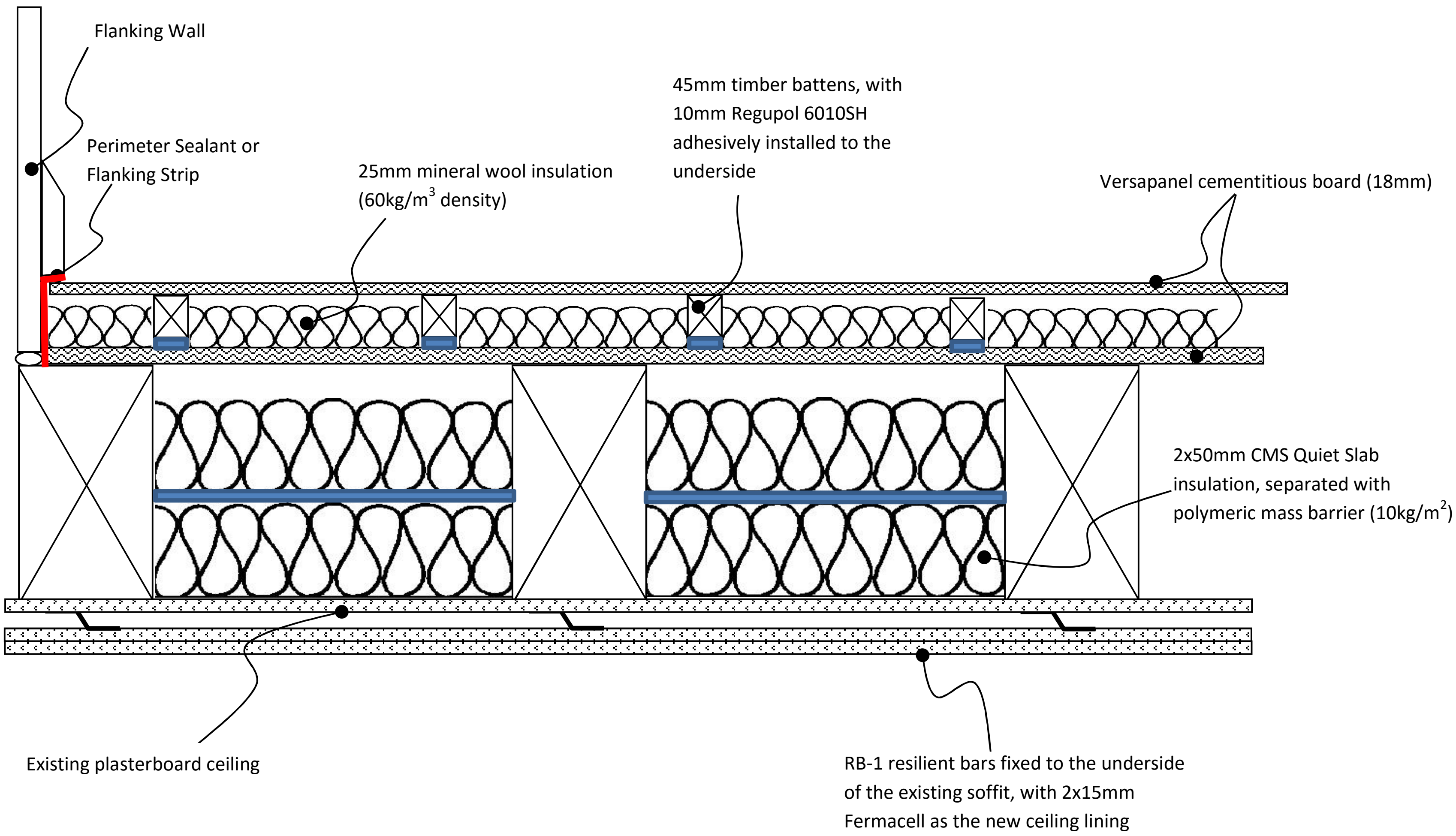

Title:

Floor Sound Insulation between first floor flats and ground floor bar - NTS

Date: 19 May 2016

Revision: B

FIGURE 13234.DWG1

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APPENDIX A

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPENDIX A

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

APPENDIX B

GROUND FLOOR BAR NOISE EMISSIONS BREAK-IN to FIRST FLOOR FLATS

Calculation 1: Direct path to Flats through separating floor with current construction

	63	125	250	500	1000	2000	4000	8000	dB(A)
Sound Pressure Level of worst case bar operation with live music (assumed Rev. Lp)	95	95	85	85	80	80	80	80	90
Separating construction (as existing)	-23	-28	-33	-43	-47	-49	-55	-60	
+ 10 log Sp (13m2)	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	
Bedroom absorption co-eff.	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	
Surface area (75m2)	45	45	45	45	45	45	45	45	
-10 log A	-17	-17	-17	-17	-17	-17	-17	-17	
Sound Pressure Level at receiver	**67**	**62**	**47**	**37**	**28**	**26**	**20**	**15**	**48**

Calculation 2: Direct path to Flats through separating floor with upgraded floor construction

	63	125	250	500	1000	2000	4000	8000	dB(A)
Sound Pressure Level of worst case bar operation with live music (assumed Rev. Lp)	95	95	85	85	80	80	80	80	90
Separating construction (including proposed upgrade measures)	-37	-47	-54	-58	-61	-59	-72	-76	
+ 10 log Sp (13m2)	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	
Bedroom absorption co-eff.	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	
Surface area (75m2)	45	45	45	45	45	45	45	45	
-10 log A	-17	-17	-17	-17	-17	-17	-17	-17	
Sound Pressure Level at receiver	**53**	**43**	**26**	**22**	**14**	**16**	**3**	**0**	**30**