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CORD BAR,
DORSEY STREET, MANCHESTER

NOISE IMPACT ASSESSMENT

Report **9804-NIA-01 RevB**

Prepared on 25 February 2015

Issued For:

The House of Adventure Ltd

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1.0 INTRODUCTION

Clement Acoustics Ltd has been commissioned by The House of Adventure Ltd to investigate and assess the noise impact from amplified music during proposed extended hours at Cord Bar, Dorsey Street, Manchester on nearby residential properties.

This report presents the results of a background noise survey and break out assessment followed by an assessment of the anticipated noise emission levels and outlines any necessary mitigation measures.

2.0 SITE DESCRIPTION

Proposals are to extend operational hours of an existing bar venue at Cord Bar, Dorsey Street, Manchester. The site is bounded by Dorsey Street to the north and Tib Street to the east. Residential receivers have been identified in all directions, including a residential flat directly above the ground floor bar area. The area is predominantly commercial, with bars, restaurants and shops located nearby on Tib Street.

The proposed hours of extension being sought are as follows:

- Friday and Saturday Nights: 23:00 to 01:00

The residential flat above the bar is most likely to be affected by noise transmission though the separating floor, while windows of a residential block across Dorsey Street and a residential block to the northwest of the side facade are most likely to be affected by noise breakout through the building facades.

3.0 PROCEDURE

3.1 Environmental Noise Survey

In order to assess existing background noise levels in the area, an environmental noise survey was undertaken from Friday to Monday at the position marked on indicative site plan 9804-SP1.

Continuous automated monitoring was undertaken for the duration of the survey between 16:00 on Friday 16 January 2015 and 11:00 on Monday 19 January 2015. Weather during the survey was dry with light winds, therefore suitable for measurement of environmental noise.

Noise levels at the noise monitoring position were predominately influenced by road traffic noise from surrounding roads and activity due to surrounding commercial premises on Tib Street and Cord Bar itself. Cord Bar was not operational during the proposed hours of extension, meaning background noise levels during this period are unaffected by existing activity.

The measurement procedure generally complied with BS7445:1991. *Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*.

3.2 Noise Breakout Assessment

During an on-site inspection potential noise breakout paths have been identified. Amplified music will be played back within basement and ground floor levels. As the ground floor presents a buffer zone to music generated at basement level, noise breakout measurements were undertaken from the ground floor, being the weakest breakout point.

The main identified paths for potential noise breakout are through the floor to the residential flat at first floor level, through the front facade to residential windows across Dorsey Street and through the side facade to windows at a residential block to the northwest.

High volume “white” noise was generated from two loudspeakers in the ground floor bar area of the venue, positioned to obtain a diffuse sound field. A spatial average of the resulting one-third octave band noise levels between 50 Hz and 20 kHz was obtained by using a moving microphone technique over a minimum period of 15 seconds at each of two positions.

Internal receiver measurements to determine the sound reduction performance of the separating floor were undertaken at first floor level, obtained by using a moving microphone technique over a minimum period of 15 seconds at each of two positions.

Further receiver measurements were conducted immediately outside the front and side facades, in order to investigate the level of breakout noise through these transmission paths.

The duration of measurements ranged from 30-90 seconds, depending on the background noise pattern.

The dominant source of background noise observed during the tests was road traffic noise from Tib Street.

4.0 EQUIPMENT

4.1 Environmental Noise Survey

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

The equipment used was as follows.

- 1 No. Svantek Type 971 Class 1 Sound Level Meter
- Norsonic Type 1251 Class 1 Calibrator

4.2 Breakout Assessment

The instrumentation used during noise breakout measurements is shown in Table 4.1 below.

Instrument	Manufacturer and Type	Serial Number
Precision integrating sound level meter & analyser	01dB-Stell Black Solo	60587
Active Loudspeaker	RCF ART 310A	HAX20870
Active Loudspeaker	RCF ART 310A	GEX05725
White Noise Source	Acoustic Solutions – 513/4043	N/A
White Noise Source	Acoustic Solutions – 513/4043	N/A
Calibrator	Norsonic Type 1251	31716

Table 4.1 Instrumentation used during breakout measurements

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

5.0 RESULTS

5.1 Environmental Noise Survey

The $L_{Aeq:\ 5min}$, $L_{Amax:\ 5min}$, $L_{A10:\ 5min}$ and $L_{A90:\ 5min}$ acoustic parameters were measured and are shown as a time history in Figure 9804-TH1.

In order to protect the amenity of nearby noise sensitive receivers, existing background noise levels were assessed for proposed extended operational hours during the period of the survey.

It should be noted that the guidance of the latest revision of BS4142:2014 detailed in Section 8.1 of the standard is as follows:

"*The objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*."

The typical background noise level for the proposed extended operational hours have been set as shown in Table 5.1.

	Typical background noise level $L_{A90:\ 5min}$ dB(A)
Proposed Extended Hours (Friday & Saturday 23:00-01:00)	53

Table 5.1: Background noise levels

5.2 Noise Breakout Levels

Summarised results of the noise breakout assessment and facade sound insulation performances are shown in Table 5.2. Breakout measurement locations are shown in 9804-SP1.

Source	Receiver	Test Element	Test Result
Ground Floor Bar Area	First Floor Bedroom	Separating Floor	D_w 61dB
	First Floor Lounge	Separating Floor and Buffer Zone	D_w 56dB
	Dorsey Street Facade [1 Entrance Door Open]	Glazed Facade	D_w 31dB
	Dorsey Street Facade [Both Entrance Doors Open]		D_w 20dB
	Side Facade [1 Entrance Door Open]	Masonry Facade with Ventilation Grille	D_w 35dB
	Side Facade [Both Entrance Doors Open]		D_w 32dB

Table 5.2 Sound insulation performance of tested elements

As shown in Table 5.2, the front facade sound reduction performance is drastically reduced when both entrance doors are opened at the same time. We would therefore recommend it is important that door staff are instructed to ensure one door is kept closed at all times when patrons are entering or exiting the premises. This is detailed in Section 8 of this report.

6.0 NOISE EMISSIONS CRITERIA

6.1 Internal Noise Levels

In order to avoid a negative impact on first floor residential spaces, it is advised that noise emissions levels due to amplified music play back should not exceed the requirements of the relevant British Standards.

BS8233:2014 "*Sound insulation and noise reduction for buildings*" describes recommended good to reasonable internal noise levels for residential spaces. These levels are shown in Table 6.1.

Activity	Location	Design range $L_{Aeq,T}$ dB Daytime (07:00-23:00)	Night-time (23:00-07:00)
Resting	Living Room	35 dB(A)	-
Dining	Dining Room/Area	40 dB(A)	-
Sleeping	Bedroom	35 dB(A)	30 dB(A)

Table 6.1: BS8233 recommended internal background noise levels

With proposed extended hours during night-time hours only, we propose to set an internal noise criterion for the bedroom of 30dB(A).

Further requirements as set by Manchester City Council are that spectral levels should not exceed 37 dB and 31 dB in the 63Hz and 125Hz frequency bands respectively.

6.2 External Noise Emissions

In order to assess the likely impact of the bar activities on nearby residential windows, we would suggest the comparison of anticipated noise emission levels to the minimum measured background noise levels (L_{A90}) and provide a rating of impact according to BS4142:2014:*'Method for rating industrial noise affecting mixed residential and industrial areas'*.

Although primarily used for assessing noise emissions of industrial activities, British Standard 4142:2014 can be seen as a good guide for assessing the suitability of noise emissions to residential receivers. In a BS4142 assessment, corrections are applied to measured noise levels in

order to calculate a noise rating level for the effects of the source on nearby noise sensitive receivers.

This assessment will compare noise emissions to the operational hours measured background noise level of 54 dB(A).

In a BS4142 assessment, corrections are applied to measured noise levels in order to calculate a noise rating level for the effects of the source on nearby noise sensitive receivers. BS4142 states that a noise rating 5dB above the background noise level is likely to be an indication of an adverse impact. If the difference is of 10dB or more, then this is stated as likely to be an indication of a significant adverse impact. Where the rating level does not exceed the background noise level, this is stated as an indication of the sound source having a low impact.

7.0 DISCUSSION

7.1 Existing Conditions

Manual measurements were taken of amplified music played back in the ground floor bar area at a level deemed typical and desirable by management. The noise levels measured are as shown in Table 7.1.

	Sound Pressure Level (dB) in each Frequency Band, at source								
Source	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**dB(A)**
Amplified Music	84	84	76	76	74	71	69	64	79

Table 7.1: Measured Music Noise Levels

These levels will be used to calculate the current noise breakout to nearby noise sensitive receivers.

For all calculated levels shown below, full formulae used and spectral calculations are shown in the corresponding Appendices B1-2.

7.2 Noise Breakout Assessment - Internal Floor between Ground Floor and First Floor

Calculations have been undertaken for potential noise transmission arising from amplified music played back within the ground floor bar area through the existing separating floor to the first floor bedroom.

Based on observed room dimensions and surface finishes within the first floor residential space, the noise transmission has been calculated using the measured sound reduction index of the separating floor and standard acoustic formulae . Results are as shown in Table 7.2, with detailed calculations shown in Appendix B1.

Receiver	Design Range – *For resting/sleeping conditions in a bedroom, in BS8233:2014*	Calculated Noise Level at Receiver (due to premises activity)
First Floor Bedroom	30 dB(A)	26 dB(A)

Table 7.2: Noise levels and criteria inside first floor residential receivers

As shown in Table 7.2 and Appendix B1, internal transmission of noise is expected to meet the requirements of the relevant British Standard.

A subjective assessment of music playback through the separating floor was that tonal elements were faintly audible. As shown in Appendix B1, the set spectral criteria for low frequency noise are also not met.

We would therefore recommend that although compliant with the British Standard, music levels should be further reduced to protect the amenity of residential receivers. Proposed noise limits are shown in the noise management plan (Section 8).

7.3 Receiver 1 Noise Breakout Assessment – Dorsey Street Facade

First floor residential windows overlooking Dorsey Street could be affected by noise emissions through the ground floor glazed facade and entrance of Cord Bar.

Levels have been calculated using amplified music levels with limits as proposed in Section 8, the measured sound reduction of the front facade and the formulae shown in Appendix B2.

In a BS4142 Assessment, corrections are applied to noise sources for tonal content. In this instance, since the noise source is music, a +6dB penalty has been applied in the calculations to account for the inherent tonal content. This is the maximum correction that can be applied.

With music played back at the above levels, noise emissions levels at the closest front facade receiver due to internal music play back would be as shown in Table 7.3.

Receiver	Operating Hours Typical Background Noise Level L90	Noise Level at Receiver (due to amplified music)
Receiver 1 Window	54 dB(A)	39 dB(A)

Table 7.3: Noise levels and criteria at Receiver 1

As shown in Table 7.3 and Appendix B2, transmission of noise to the nearest sensitive windows due to the effects of the pub activity would provide a noise rating level of -15 dB when compared to the minimum background noise level. This would be classed as an indication of the sound source having a low impact as defined in the standard.

Further comparison with spectral background noise levels is shown in Appendix B2. It is confirmed that the calculated specific noise levels are at least 10 dB below the background noise in all frequency bands.

7.4 Receiver 2 Noise Breakout Assessment – Side Facade

First floor residential windows overlooking the side facade could be affected by noise emissions through the masonry facade and ventilation grille.

Levels have been calculated using amplified music levels with limits as proposed in Section 8, the measured sound reduction of the side facade and the formulae shown in Appendix B2.

In a BS4142 Assessment, corrections are applied to noise sources for tonal content. In this instance, since the noise source is music, a +6dB penalty has been applied in the calculations to account for the inherent tonal content. This is the maximum correction that can be applied.

With music played back at the above levels, noise emissions levels at the closest front facade receiver due to internal music play back would be as shown in Table 7.4.

Receiver	Operating Hours Typical Background Noise Level L90	Noise Level at Receiver (due to amplified music)
Receiver 2 Window	54 dB(A)	35 dB(A)

Table 7.4: Noise levels and criteria at Receiver 2

As shown in Table 7.4 and Appendix B2, transmission of noise to the nearest sensitive windows due to the effects of the pub activity would provide a noise rating level of -19 dB when compared to the minimum background noise level. This would be classed as an indication of the sound source having a low impact as defined in the standard.

Further comparison with spectral background noise levels is shown in Appendix B2. It is confirmed that the calculated specific noise levels are at least 10 dB below the background noise in all frequency bands.

8.0 PROPOSED NOISE MANAGEMENT PLAN

In order to ensure the calculated noise emission levels are not exceeded, we would recommend following certain steps when operating the basement as a nightclub, as detailed below:

- Although noise emissions are expected to comply with British Standard recommendations, we would recommend limiting noise levels to remove a subjectively audible tonal element within the first floor flat. We would recommend maximum noise levels as follows

Source	Low Frequency Limits		Overall Limit
	63Hz	125Hz	
Amplified Music	79 dB	75 dB	74 dB(A)

- The levels shown above should be achieved during the proposed hours of extension through the use of a noise limiter. The noise limiter should be calibrated to ensure the levels are not exceeded when activated and should be located such that only management has access.
- It should be ensured that loudspeakers are resiliently fixed to the building structure, such that structure borne noise is minimised,
- Door staff should be instructed to ensure that entrance doors are kept closed where possible,
- When patrons are entering or existing the premises, the lobby area should be used to ensure at least one door stays closed at all times,

- Door staff should also remind patrons using the nightclub of the residential nature of surrounding premises and behaviour outside the premises should be monitored accordingly.

9.0 CONCLUSION

A noise survey has been undertaken at Cord Bar, Dorsey Street, Manchester. The results of the survey, combined with noise breakout measurements, have enabled the assessment of noise propagation of amplified music playback within the ground floor bar to surrounding receivers.

Calculations have been based on measured noise breakout through the ground floor facade on Dorsey Street and through a shared separating floor with residential flats.

Calculations have shown that the noise from amplified music playback within the bar would meet the set noise criteria during proposed extended operational hours. Further calculations have shown that the recommendations of the relevant British Standard would also be met.

An outline noise management plan has been recommended, in order to minimise noise transmission due to other factors.

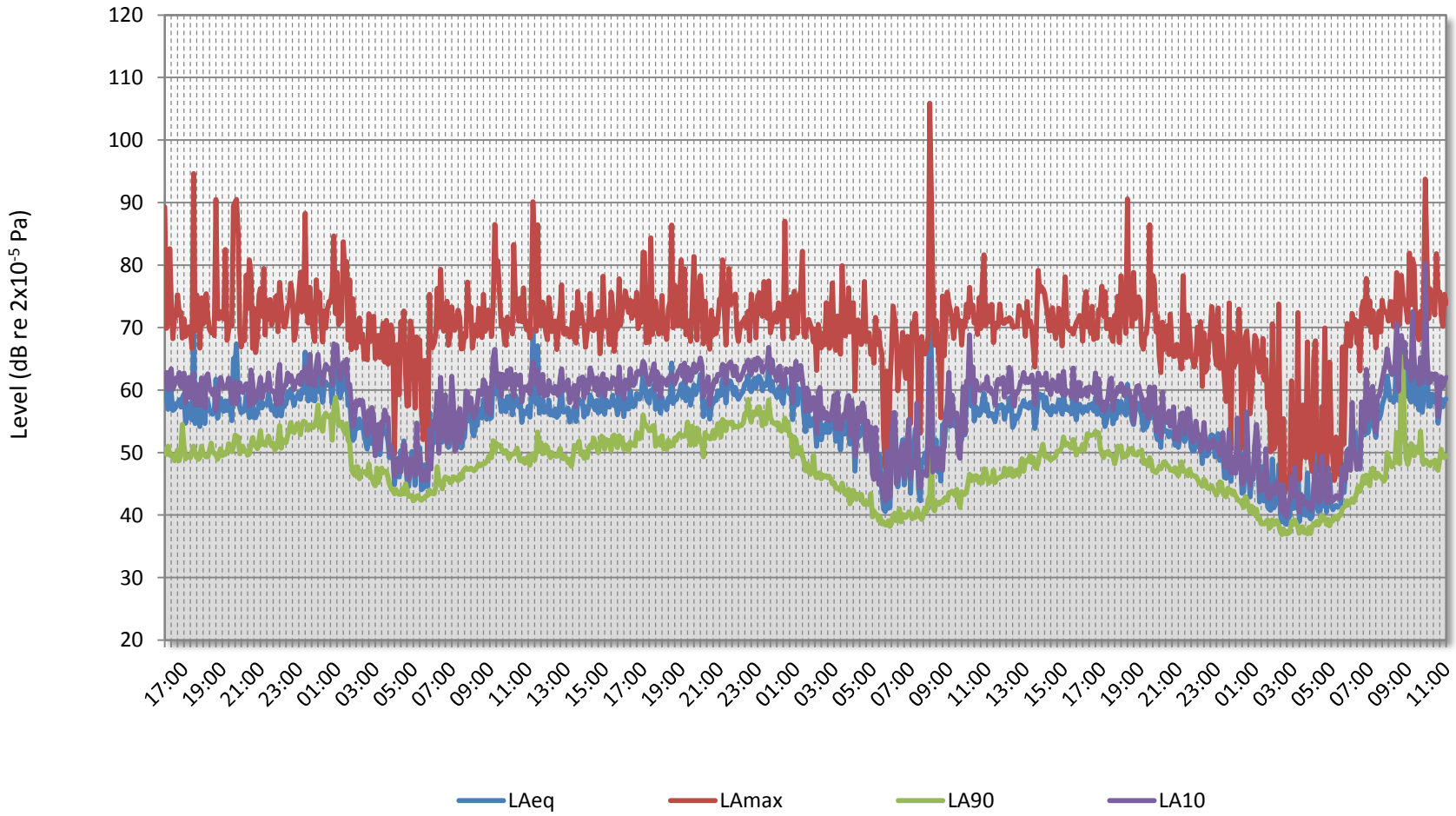
Report by	Checked by
Duncan Martin MIOA	**Florian Clement MIOA**



9804-SP1 Indicative site plan showing noise monitoring position and nearest noise sensitive receiver **Date:** 25 February 2015

Cord Bar, Dorsey Street, Manchester

Environmental Noise Time History
16 January 2015 to 19 January 2015



9804-TH1

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and 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 not 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 not 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 10 such octave bands whose centre frequencies are defined in accordance with international standards.

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 one alone and 10 sources produce a 10dB 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

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception 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 reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.

APPENDIX B1

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Cord Bar, Dorsey Street, Manchester

Acoustic Calculation used for Room to Room Transmission:

$$SPL_2 = SPL_1 - R + 10\log_{10} S - 10\log_{10} A$$

APPENDIX B1: First Floor Residential Flat Bedroom
Source: Music Playback Levels

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Internal Measured Sound Pressure Level									
Measured Music Source Noise Level Within Ground Floor	84	84	76	76	74	71	69	64	79
Measured Sound Reduction of separating floor, dB (R)	-42	-44	-51	-57	-63	-66	-67	-66	
Correction for total area of floor (S = 12m^2)	11	11	11	11	11	11	11	11	
Correction for absorption area of receiver room (A = 12m^2)	-11	-11	-11	-11	-11	-11	-11	-11	
Sound pressure level at receiver	**42**	**40**	**25**	**19**	**11**	**5**	**2**	**0**	**26**

Design Criterion	**30-35**

APPENDIX B2

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Cord Bar, Dorsey Street, Manchester

Acoustic Calculation used for Indoor to Outdoor Transmission:

$$SPL_{outdoor} = SPL_{indoor} - SRI_{composite} + 10\log_{10} S + 10\log\left(\frac{Q}{4\pi r^2}\right) - 6dB$$

Receiver 1: Dorsey Road Facade Assessment
Source: Music Playback Levels

	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Internal Sound Pressure Level Limited Source Noise Level Within Ground Floor	79	75	76	76	74	71	69	64	79
Measured Sound Reduction of front facade, dB (SRI)	-20	-25	-23	-25	-31	-35	-34	-35	
Correction for total area of building facade (S = 12m^2)	11	11	11	11	11	11	11	11	
Correction for directivity (Q) and distance (r) (Q=4, r = 8m)	-23	-23	-23	-23	-23	-23	-23	-23	
Non reverberant correction	-6	-6	-6	-6	-6	-6	-6	-6	
Correction for tonal content of noise emissions	6	6	6	6	6	6	6	6	
Sound pressure level at receiver due to music play back	**47**	**38**	**41**	**39**	**31**	**24**	**23**	**17**	**39**
Typical Background Noise Levels	**59**	**61**	**52**	**50**	**49**	**43**	**40**	**31**	**54**
					Difference between rating level and background				**-15**

Receiver 2: Side Facade Assessment
Source: Music Playback Levels

	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Internal Sound Pressure Level Limited Source Noise Level Within Ground Floor	79	75	76	76	74	71	69	64	79
Measured Sound Reduction of side facade, dB (SRI)	-24	-26	-27	-29	-37	-38	-37	-38	
Correction for total area of building facade (S = 12m^2)	11	11	11	11	11	11	11	11	
Correction for directivity (Q) and distance (r) (Q=4, r = 8m)	-23	-23	-23	-23	-23	-23	-23	-23	
Non reverberant correction	-6	-6	-6	-6	-6	-6	-6	-6	
Correction for tonal content of noise emissions	6	6	6	6	6	6	6	6	
Sound pressure level at receiver due to music play back	**43**	**37**	**37**	**35**	**25**	**21**	**20**	**14**	**35**
Typical Background Noise Levels	**59**	**61**	**52**	**50**	**49**	**43**	**40**	**31**	**54**
					Difference between rating level and background				**-19**