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UNIT 1, CHICHESTER RENTS 79-86 CHANCERY LANE, LONDON

Report 15874.ADR.02

Prepared on 11 August 2017

For:

Urban Fitness London Group Ltd

Cliff Farm House,

Ingham

LN1 2YQ

Site Address	Test Date	Tested by
Unit 1, Chichester Rents 79-86 Chancery Lane, London	02/08/2017	Victor C. Lindstrom AMIOA Kyriakos Papanagiotou MIOA

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1.0 INTRODUCTION

KP Acoustics Ltd., Britannia House, 11 Glenthorne Road, London, W6 0LH has been commissioned by Urban Fitness London Group Ltd, Cliff Farm House, Ingham, LN1 2YQ to undertake further noise measurements as part of the sound insulation investigation between the proposed basement and Ground Floor gym space at Unit 1, Chichester Rents, 79-86 Chancery Lane, London, and the office spaces directly above the proposed gym space.

In order to complement the sound insulation investigation findings presented in the original report 15874.ADR.01, the main objective of this assessment is to provide further information and analysis with regards to the current sound insulation properties of the separating floor and façade elements.

Contrary to the original noise and vibration survey where access to only one office room was provided, access to all relevant areas of the First Floor office was granted for this second survey.

The sound insulation investigation was witnessed by members of Sharps Redmore acoustic consultancy, on behalf of the building's Landlord.

The underlying motivation is to provide a bespoke design which would render any noise, or vibration from the operation of the proposed gym, as unimpeding as possible to the amenity of the office spaces above.

2.0 SITE DESCRIPTION

The space occupies the rear half of the building extension and is comprised of a basement and ground floor space. The unit is bounded from internal alleyways to the East and South, Bishop's Court to the North and Star Yard to the West

Currently, the main area of the proposed gym at ground floor has windows across the full North, East and South façade overlooking the internal alleyways.

The receiver spaces which was investigated during this second sound insulation investigation were named as follows:

- Samar Office
- Hughes Office
- Pugh Smith Office
- Open Plan Office

3.0 SOUND & VIBRATION INSULATION INVESTIGATION

A sound insulation investigation was undertaken on site in order to provide acoustic upgrade advice with regards to the separating floor and façade elements between the proposed gym and the first Floor office units above.

3.1 Basement-First Floor Office Airborne Tests

High volume music noise with low frequency content was generated from two loudspeakers at basement level in the area where a spinning studio is proposed as it would represent the worst case scenario of loud music being played in the proposed gym space.

A spatial average of the resulting one-third octave broadband noise levels was obtained by using a moving microphone technique over a minimum period of 10 seconds.

The same measurement procedure was used in the receiver spaces.

The background noise levels in the receiver rooms were measured during the tests using the same measurement procedure.

The background noise in the office spaces was mainly dominated by building services noise.

It must be noted that the background noise measurements were undertaken during periods without any work activity within receiver's office, which would cater for a lower background noise than normally anticipated.

3.2 Break Out Sound Insulation Test

High volume "pink" noise was generated from one loudspeaker in the Ground Floor area of the proposed gym unit, positioned to obtain a diffuse sound field. A spatial average of the resulting one-third octave broadband noise levels was obtained by using a moving microphone technique over a minimum period of 10 seconds.

The same measurement procedure was used outdoors at the South and North alleyways surrounding the building.

3.3 Equipment

The equipment used during testing is shown in Table 3.1 below

Instrument	Manufacturer and Type	Serial Number
Precision integrating sound and vibration level meter & analyser	1 No. Svantek Type 958A Class 1	45579
Active Loudspeaker	RCF ART 310A	HAX20864
Active Loudspeaker	JBL Power15	-
Accelerometer	Dytran 3233A	LW186411
Calibrator	B&K Type 4231	1897774
Specialist Software	Svantek. Svan PC++	-

Table 3.1 Instrumentation used during testing

3.4 Results

3.4.1. Gym Basement-First Floor Office Airborne Tests Results

The results of the sound insulation test between the proposed gym basement and the First Floor offices are summarised in Tables B.1-B.5 on the attached Appendix B.

The results presented show the L_{max} noise levels measured at the source and receiver spaces. The receiver L_{Max} and L_{90} noise levels.

The results show the third octave frequency band 50-500 Hz range and overall levels as this would represent the relevant information for the airborne test assessment.

3.4.2. Ground Floor Gym space – Ground Floor Outdoor alleyways Airborne Tests Results

The results of the sound insulation performance of the current Ground Floor façade are summarised in Table B.6 and B.7 of the attached Appendix B.

For airborne tests, the higher the value, the better the performance. All tests have been assessed by using D (noise level difference) as the main airborne sound insulation descriptor. This descriptor was chosen as it would encompass all current features of the spaces within the calculation procedure and provide a more realistic appreciation of the airborne insulation envelope of the external glazed facade constructions.

The results show the third octave frequency band 50-500 Hz range and overall levels as this would represent the relevant information for the airborne test assessment.

3.5 Discussion

The following figures show the different proposed gym spaces.

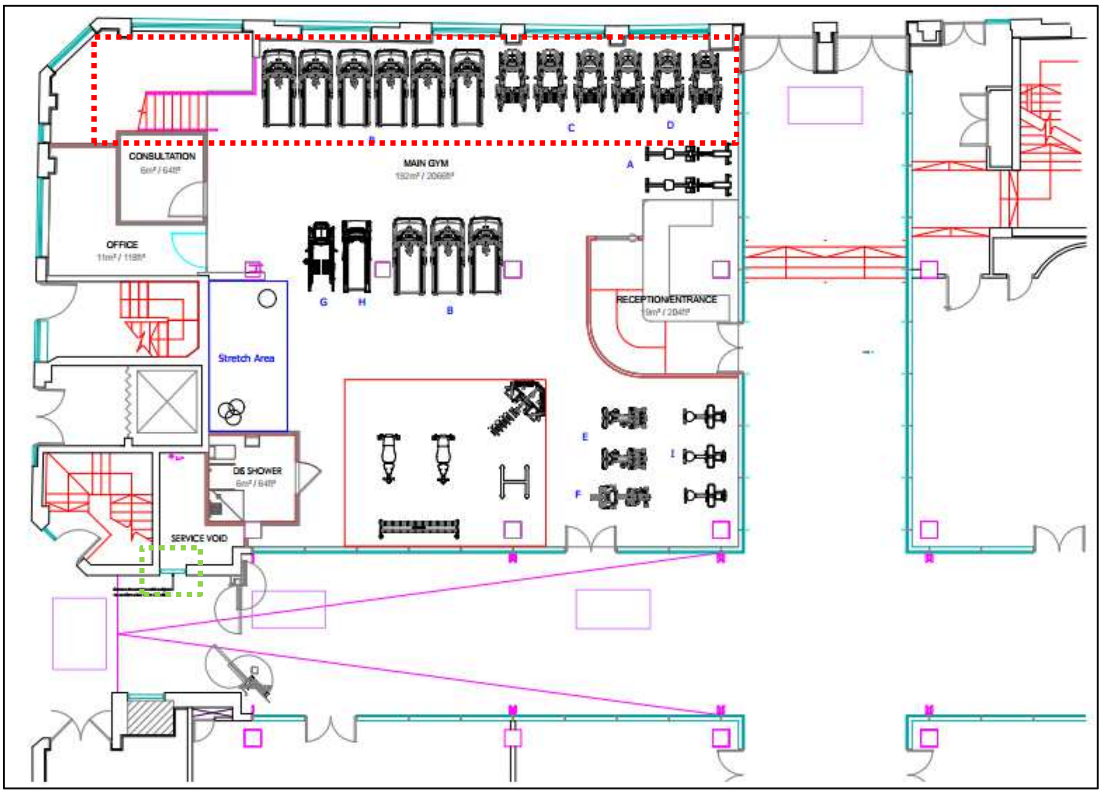

Figure 3.1 Indicative Drawing of the proposed Ground Floor gym space

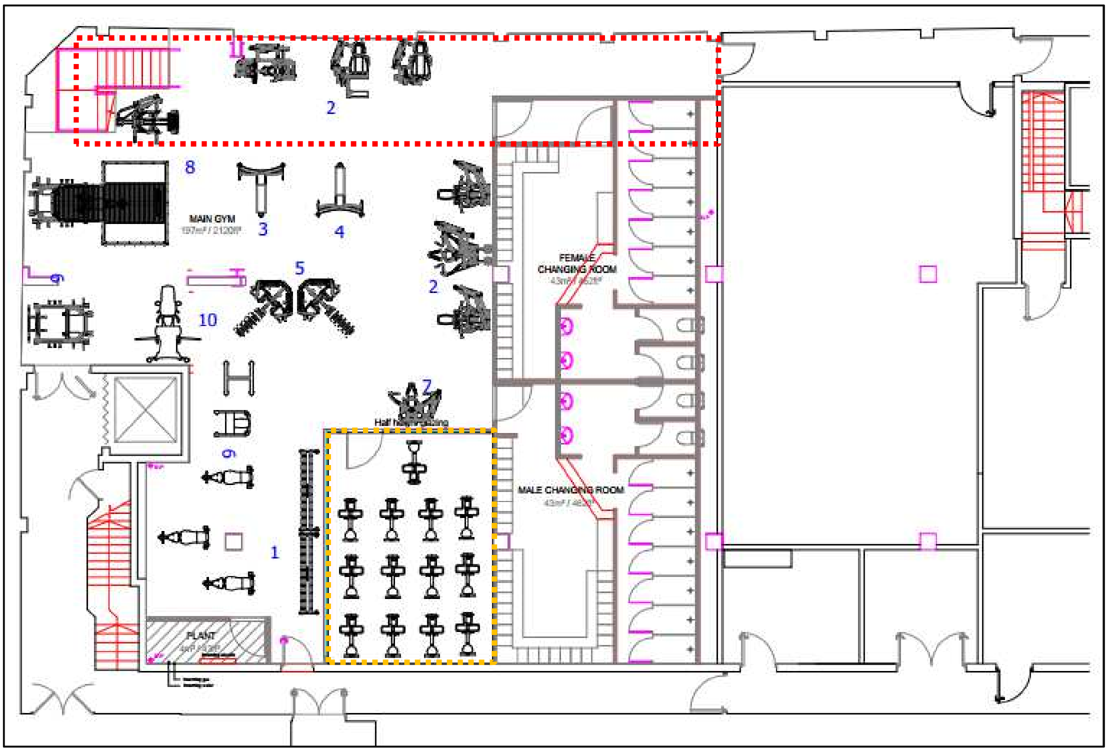

Figure 3.2 Indicative Drawing of the proposed Basement Floor gym space

It should be noted that during the sound insulation tests:

- The proposed basement and Ground Floor gym spaces were empty, without internal partitions and acoustically untreated with the concrete shell completely exposed.
- The music test signal was generated in the basement open area. However, the future worst case scenario of high levels of music in the gym would take place in an enclosed spinning studio space, indicated with orange dotted line in Figure 3.2, providing a significant noise reduction.
- The portion of the floor slab between basement and Ground Floor level, indicated in red dotted line in Figures 3.1 and 3.2, was non-existent. It would be completed during the refurbishment works for the proposed gym. Only the staircase connecting both levels would allow for a small open area between them, hence, providing a significant noise reduction to the Ground Floor Area
- It was agreed between both KP Acoustics and Sharps Redmore consultants that the main noise perceived within the office spaces was breaking in from the surrounding alleyways. Further observations confirmed that most of the noise from the Ground Floor level was breaking out through the glazed façades' lintels.
- It was also observed that the existing louvred area on the South west corner of the Ground floor façade, marked with green dotted line in Figure 3.1, was a weak point of break out noise. However, as shown in Figure 3, this louvered area would be isolated from the Basement and Ground Floor area within the service void.
- The music inside Pugh Smith office could not be distinguished from the background noise when the music was off by representatives of both KP Acoustics and Sharps Redmore consultants. This was due to a higher background noise level from the air conditioning service than in the rest of the First Floor office spaces tested.

When comparing the L_{Max} gym music level measured in the First Floor office with the office background L_{90} noise level measured without music being played in the current basement area, Samar Office 20-28dB exceedance figures, shown in Appendix B Table B.2, would represent the receiver's worst-case scenario of noise intrusion.

Based on the above observation and the measured noise level differences the proposed sound insulation upgrades in Section 4.0 are recommended

4.0 ACOUSTIC DESIGN ADVICE – INTERNAL BUILDING FABRIC

The aim of the hereby proposed noise control upgrades would be minimising the noise intrusion to neighbouring properties, and particularly the low frequency content of music generated in the proposed spinning studio gym space.

Based on the above sound insulation investigation results as well as site observations, we would recommend the following upgrade measures:

4.1 Separating Floors between Gym and Office Units

The installation of a suspended ceiling is recommended at both Basement and Ground Floor level of the proposed gym . This could be built by means of a metal framed suspended via GAH2 resilient hangers with a minimum 100mm ceiling void below the concrete soffit, 75mm mineral wool infill (45 Kg/m^3 minimum density) and 2x12.5mm SoundBloc as the main ceiling lining.

Should cassette type A/C units are installed in the ceiling void, they need to be boxed-in with the same proposed suspended ceiling elements.

4.2 Façade Internal Upgrade

The lintels of the gym's Ground Floor glazed façade, shown in Figure 4.1 and Figure 4.2 should be contained within the recommended suspended ceiling or be internally lined allowing a 100mm void behind the top panel with 75mm mineral wool infill (45 Kg/m^3 minimum density) and 2x12.5mm SoundBloc boards.

Figure 4.1. Internal photograph of the North glazed façade's lintel

Figure 4.2. Internal photograph of the South glazed façade's lintel

It is not considered necessary to upgrade the current glazed panels of the Ground Floor facades. However, should further insulation is required once the gym activities noise levels have been commissioned, the installation of a 4-6mm secondary glazing with a minimum 75mm cavity behind the current system is recommended.

4.3 Walls, Columns and Beams Isolation

All columns and beams are to be boxed-in by means of clip-on framing system with GypLyner Encase (or similar) and 2x12.5mm layers of SoundBloc plasterboard (or similar).

For those I-beams already embedded in concrete columns at ground floor, the use of RB1 reislient bars and12.5mm SoundBloc lining is recommended. The same isolation scheme is recommended for the perimeter walls internal lining at Ground Floor level.

It is understood that the basement space would contain a free-weights training area and a spinning studio. These areas are commonly exposed to high levels of noise due to dropping weights and high levels of music, respectively. We therefore proposed for those I-beams already embedded in concrete columns, to encase them by means of CMS-Danskin Isomax clips and 2x12.5mm SoundBloc boards. The same isolation scheme is recommended for the perimeter walls internal lining at Basement level.

4.4 Spinning Studio

In order to reduce any weak flanking paths from the spinning studio to the First Floor office space, we would propose the installation of the spinning studio wall separated from any structural wall and column. In this instance, a minimum separation of 100 mm is recommended between the rear wall of the studio and the structural wall behind with 50mm mineral wool cavity infill (45 Kg/m3 minimum density).

It is understood that the top half of the lateral and front walls of the proposed spinning room would comprised of a glazed system. In order to achieve adequate sound insulation in low frequencies, it is recommended a glazed system with a minimum sound reduction Index of 33 dB R_w+C_{tr}.

It is recommended that the non-glazed part of the walls is built with 2x15mm SoundBloc on each side of a 90mm acoustic metal studs frame and 50mm mineral wool insulation infill (45 Kg/m3 minimum density).

It is also recommended that the proposed door system of the spinning area provides a minimum R_w 37 dB sound reduction index.

4.5 Free Weights Isolation

Although free weights drop onto the basement floor during gym activities was not considered a potential major adverse effect in the office space above by Sharps Redmore, free weight drop test were also undertaken in this second assessment.

The test procedure followed the same line as the one undertaken for the first assessment. However, in this instance, Samar office was chosen to undertake the vibration measurements at the base of a structural column due to its low background noise.

Similar to the first vibration survey, the noise created inside the office due to the impact of free weight on the basement bare concrete slab could be faintly appreciated by both KP Acoustics and Sharps Redmore consultants.

The same procedure was repeated dropping the free weight onto Regupol FX50 anti-vibration matt. Both KP Acoustics and Sharps Redmore consultants could not hear, or feel any noise or vibration due to the free weight impact.

It is therefore recommended, following our advice in the original report (ref. 15874.ADR.01), the installation of one of the following options for the free weight gym area floor:

- Option 1: Regupol FX50 + 4mm BSW everroll compact rubber gym flooring tiles
- Option 2: 25mm Regufoam 270 plus on the concrete slab + 29mm BSW Everroll Multitile

It is also recommended that 10mm Regupol 6010SH strips are installed where the proposed anti-vibration tiles abut perimeter elements.

Please note that this floor isolation strategy would be useful for typical dumbbells up to 30-40kg. Should a heavy-weight platform be used, a different isolation strategy would need to be employed. The above treatment will need to be localised, i.e. applied only on the area of the free weights.

The vibration control strategy hereby proposed would mean, in practical terms, that any potential physical floor vibration due to any free weights would be minimised and any final perceived aural component would be comparable to the ambient noise footprint of the area.

4.6 Wall Junctions and Penetration Details

Interfaces between walls and all other adjacent elements should be built to ensure that the sound insulation performance of the wall is not affected. All gaps should be tightly packed with mineral wool and all joints should be sealed with a flexible sealant, such as silicone caulk.

Where any ducts, pipes, conduits or other services penetrate the wall, provide an air-tight seal between the service and partition using a flexible sealant. All gaps should be tightly packed with mineral wool and sealed with plasterboard pattress and mastic seal. We would recommend the incorporation of PFC Corofil intumescent collars in all pipe penetrations.

All partitions should ideally be built off the concrete slab. In this case, isolating strips such as Monarfloor or CMS-Danskin should be used in order to block horizontal flanking.
In the case of additional heavy fixtures or services, 150FC90 nogging channels could be employed without significantly affecting the sound insulation properties of the walls.

In the case where glazed partitions abut onto structural elements such as flanking (external) walls, or columns, a proprietary sealing system should be used. We would recommend the installation of Regupol 6010XHT (or similar), cut to the width of the partition and adhesively fixed at the abutment joint.

4.7 Reverberation Control

The reverberation time within the gym space would be assumed to be excessive due to the existing shell and core nature of the unit. Albeit, measurements were not undertaken per-se, we would recommend the installation of absorptive finishes which would be rugged, while satisfying the aesthetics of the space. For this reason, we would suggest the installation of the following elements:

- Fibral Multiflex panels from Rockfon
- VertiQ wall treatment from Rockfon
- Techmel from JCW

4.8 Distributed Sound System

A loudspeaker system employing relatively few speakers requires each unit to generate high noise levels to maintain a given noise level in the space.

A distributed system with numerous speakers allows each speaker to operate at a lower volume. This ensures that localised noise levels are lower, which reduces the noise directly incident on the structure and improves the environment in quieter areas, where communication is important.

This also allows the division of the system into separately controlled zones and focus areas. Such design measures can be used to maintain “quiet” areas in the gym and provide focused loud areas (e.g. over aerobics classes).

The specifications of the speakers will be dependent on the use of each zone or focus area but should allow sufficient capacity for them to operate at optimum efficiency.

Speakers must not be ceiling-mounted and will require specific acoustic isolation treatment. A layer of Regupol 6010XHT should be introduced between the fixing plate of the loudspeaker and the fixing in order to isolate any vibroacoustic excitations transferring into the structural wall. Hilti fixings should be incorporated if the fixings penetrate into the columns. Alternatively, Regupol Isolating collars should be used under to bolt-heads, in conjunction with the aforementioned Regupol isolating layer.

4.9 Loudspeaker Mounting

Rigid mounting systems are entirely inadequate for the control of transmitted sound from the speakers. To ensure efficient control of noise it is recommended that a proprietary frame support is used for each speaker.

This must incorporate suitable anti-vibration mounting between support and speaker enclosure, with no rigid connections permitted to short-circuit the isolation.

Provided that the weight of the loudspeakers is low, the use of neoprene mounts or hangers is recommended. These are expected to provide a static deflection of approximately 3mm (ie. under the load of the speaker). High stiffness neoprene / rubber and metal springs should be avoided in general. The use of neoprene mounts or hangers in fully-enclosed metal casings is not advisable as if these are angled the casings can short circuit. Any mount / hanger must be capable of maintaining a 30 degree offset without any rigid components short-circuiting the mount. It must be noted, however, that vertical alignment is more effective.

Generally available speaker vibration mountings are not typically effective for isolation of this standard. Use of heavy duty, proprietary supports coupled with hangers / mounts will be far more effective.

For Bass cabinets placed on the floor, we would recommend ND-A-Black isolators from Mason UK.

4.10 Sound Limiter

The system designer should be able to advise on the type and standard of sound limiter suitable for the proposed installation.

The limiter should enable the separate control of the different zones and incorporate all elements of the revised system, including any additional filters or amplifiers. Programmable limiters are preferred as these permit more sophisticated control of frequency content and volume and are fully tamper-proof.

The use of a limiter is considered to be a management function. It will need to be set in conjunction with the gym’s management in co-ordination with the above office spaces and the sound system engineer. The principal means of ensuring satisfactory limits are established will be listening tests in the office spaces above.

On-going attention will need to be given by the management to transmitted noise levels to ensure that the final operational conditions do not undermine the settings of the limiter. Different types of music and activities can result in varied subjective effects. It is strongly recommended that the management remain aware as the operation becomes established and reset the limiter if necessary.

In order to control the frequency content and noise level of the amplified music and speech of future spinning classes, a sound limiter was proposed in the original report with an overall limiting level of 90 $L_{Aeq,\,30\,sec}$. Third Octave Frequency bands are proposed to be limited up to 88 dB(A), which not only would provide headroom for good internal noise levels in the office space but also a satisfactory level of music inside the spinning room.

It is assumed that other areas of the proposed gym would not entail high levels of music. However, it is recommended that the music level at Ground Floor is limited to 75 dB(A) $L_{Aeq,\,30\,sec.}$

5.0 CONCLUSIONS

A second testing regime involving sound and vibration insulation tests was undertaken between the proposed gym at Basement and Ground Floors in Unit 1, Chichester Rents, 79-86 Chancery Lane, London and the First Floor office spaces above by KP Acoustics and witnessed by members of Sharps Redmore acoustic consultancy, appointed by the building’s Landord.

This second assessment was requested by the building’s Landlord in order to confirm the suitability of the noise and vibration control measures proposed in the original 15874.ADR.01 assessment and associated 15874.170615.L1 addendum letter.

Practical measures for the upgrade of the floors and internal construction elements performance recommended in this second assessment have followed the main lines of the first assessment without any significant changes. The upgrade proposals were discussed and agreed on-site with the Sharps Redmore consultants.

The acoustic design review and advice provided in this document are based on the assumption that there will be no major mistakes in workmanship regarding the acoustic detailing and finishing of the party elements proposed in this development.

Report by	Checked by
Victor C. Lindstrom AMIOA **KP Acoustics**	**Kyriakos Papanagiotou MIOA** **KP Acoustics**

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

GYM BASEMENT to 1st FLOOR OFFICES SOUND INSULATION TEST RESULTS

Source: Gym Basement	Third Octave Frequency Band											Overall
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	
Source L_{Max} Music on	99	106	102	102	104	105	107	93	98	95	91	99

Table B.1 Averaged L_{Max} noise level measured at source.

Source: Gym Basement Receive: Samar Office	Third Octave Frequency Band											Overall
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	
Receiver L_{Max}. Music on	47	59	58	59	61	58	51	40	36	31	34	47
Receiver L_{90}, Music off	35	26	31	29	26	26	18	17	17	15	12	27
Receiver L_{Max}-L_{90} Exceedence	5	26	20	23	28	25	26	16	12	9	15	20

Table B.2 Noise levels measured at Samar Office.

Source: Gym Basement Receive: Hughs Office	Third Octave Frequency Band											Overall
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	
Receiver L_{Max}. Music on	53	58	58	56	53	55	46	40	36	31	33	46
Receiver L_{90}, Music off	30	35	31	32	33	35	25	20	19	15	12	28
Receiver L_{Max}-L_{90} Exceedence	16	17	21	19	16	14	14	10	8	7	10	18

Table B.3 Noise levels measured at Hughs Office.

Source: Gym Basement Receive: Pugh Smith Office	Third Octave Frequency Band											Overall
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	
Receiver L_{Max}. Music on	58	62	62	62	61	60	50	46	43	41	44	49
Receiver L_{90}, Music off	52	45	44	44	44	38	37	36	36	36	52	43
Receiver L_{Max}-L_{90} Exceedence	10	10	17	18	17	16	12	9	7	5	8	7

Table B.4 Noise levels measured at Pugh Smith Office.

Source: Gym Basement Receive: Open Plan Office	Third Octave Frequency Band											Overall
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	
Receiver L_{Max}. Music on	59	58	64	64	60	57	48	41	43	40	38	49
Receiver L_{90}, Music off	39	40	37	36	35	35	33	30	29	27	27	36
Receiver L_{Max}-L_{90} Exceedence	20	18	27	28	25	22	15	11	14	13	11	13

Table B.5 Noise levels measured at the Open Plan Office

BREAK OUT SOUND INSULATION TEST RESULTS

Source: Gym Ground Floor Receiver: North Alleyway	Third Octave Frequency Band											Overall
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	
Pink Noise Source Leq	75	87	96	102	102	100	97	96	95	95	94	102
Receiver Leq	81	90	76	86	84	80	79	77	74	74	74	81
Background Leq	81	91	73	79	69	61	66	63	64	61	65	73
Resultant noise level difference (D)	6	12	24	18	19	20	19	19	21	21	21	22

Table B.6 Measured noise level difference provided by the current North glazed façade at the proposed Ground Floor Gym space

Source: Gym Ground Floor Receiver: South Alleyway	Third Octave Frequency Band											Overall
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	
Pink Noise Source Leq	75	88	97	102	103	100	97	96	95	95	94	102
Receiver Leq	66	72	79	83	87	82	78	75	75	74	73	81
Background Leq	64	68	60	60	60	62	55	53	54	50	51	58
Resultant noise level difference (D)	7	11	18	19	16	19	20	21	21	21	21	21

Table B.7 Measured noise level difference provided by the current South glazed façade at the proposed Ground Floor Gym space