



ANYTIME FITNESS

ANYTIME FITNESS, HEMEL HEMPSTEAD

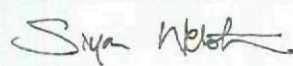
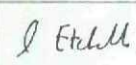
ACOUSTIC REVIEW

R0425-REP01-SJW

23 JUNE 2011



REPORT DETAILS

Project	Proposed Anytime Fitness Development Hemel Hempstead
Client	Anytime Fitness
Document Reference	R0425-REP01-SJW
Date Issued	20 June 2011
Revision	Initial Version
Issued By	Simon Webster BEng (Hons) MIOA Red Acoustics Limited Suite 3 Cottam Lane Business Centre Cottam Lane Preston PR2 1JR T: 01772 722 182 F: 01772 722 451 M: 07775 850 378 simonwebster@redacoustics.co.uk
Signed	
Checked by	Ian Etchells BEng(Hons) MIOA
Signed	

1.0 INTRODUCTION

Red Acoustics has been commissioned by Anytime Fitness to provide an assessment of noise impact relating to the proposed Anytime Fitness development within currently unoccupied shell units at Riverside, Hemel Hempstead.

Red Acoustics has been commissioned by Anytime Fitness to conduct the following assessments:

- Measure the airborne sound insulation between the existing shell units and the adjacent noise sensitive spaces to the gym unit and provide guidance on internal noise and vibration transfer for compliance with the project acoustic specification.

This report presents the results of the sound insulation and vibration transfer tests and identifies the existing level of internal noise and vibration transfer from the proposed gym shell units into nearby receptors and identifies any remedial measures that may be necessary to minimise disturbance of occupants of adjacent spaces from general activity noise and vibration and music reproduction within the proposed gym units.

2.0 DESCRIPTION OF THE SITE & PROPOSED LAYOUT

The proposed gym unit is to be located at ground and first floor level within Unit 5, Riverside, Hemel Hempstead, as shown in Figure 1 below.

Figure 1: Location of Gym Units and Adjacent Noise Sensitive Spaces



Figure 2: Proposed Ground Floor Layout

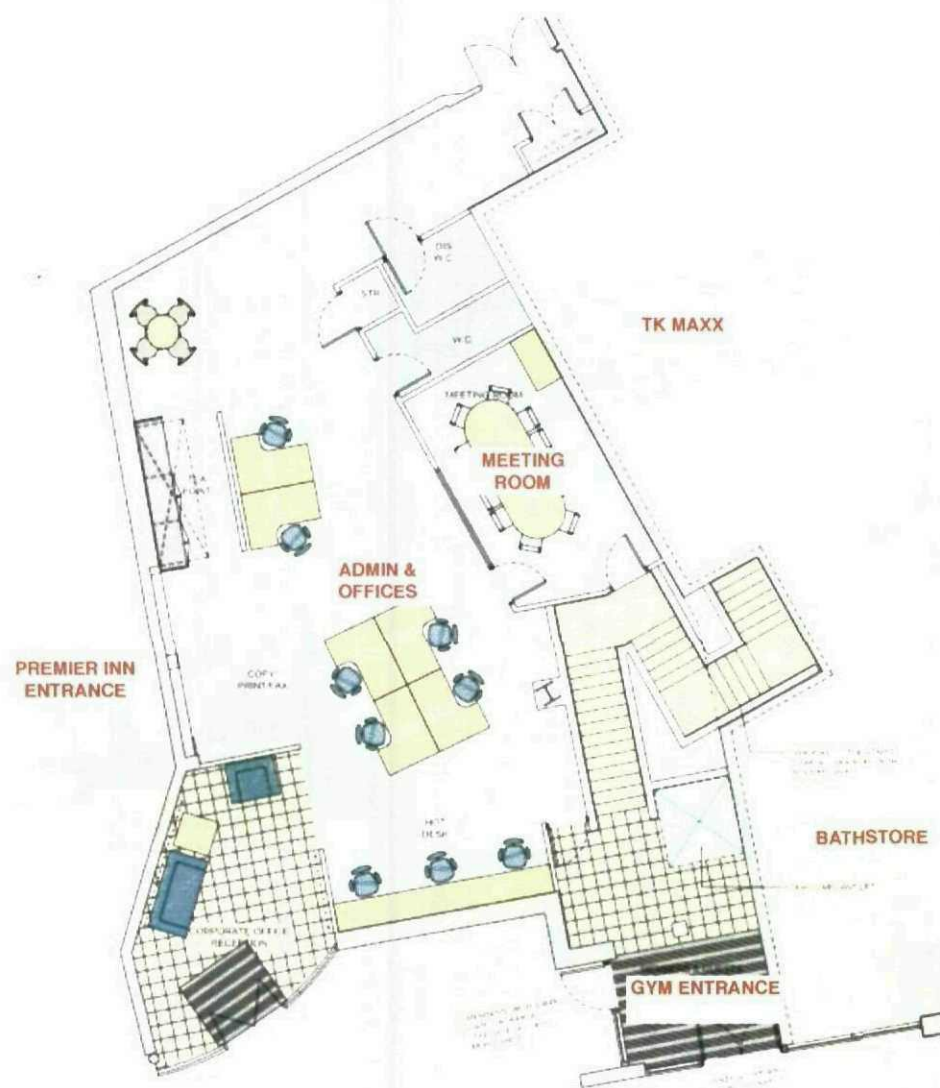


Figure 3 below shows the proposed gym space at first floor level and associated location of nearby receptors.

Figure 3: Proposed First Floor Layout

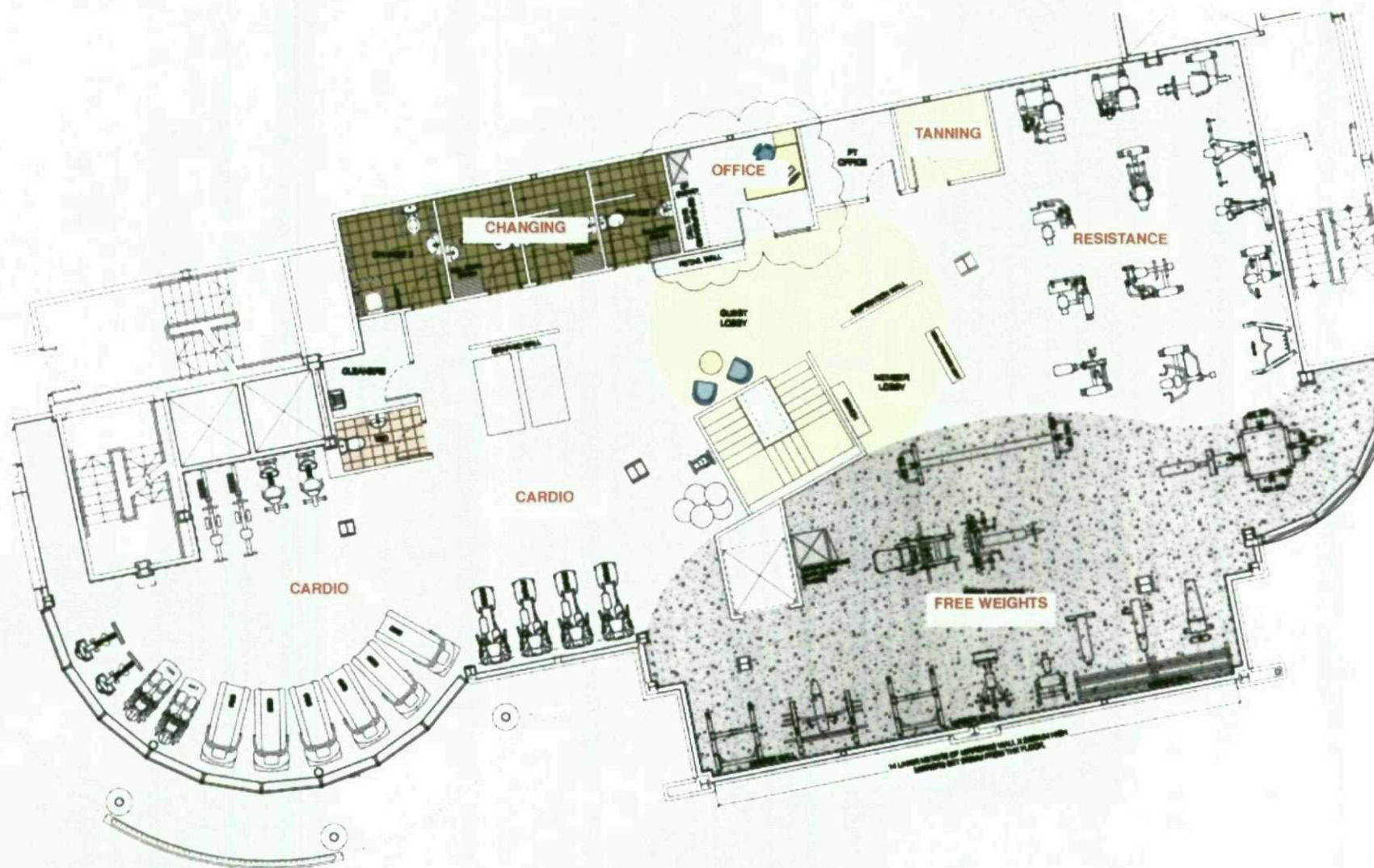
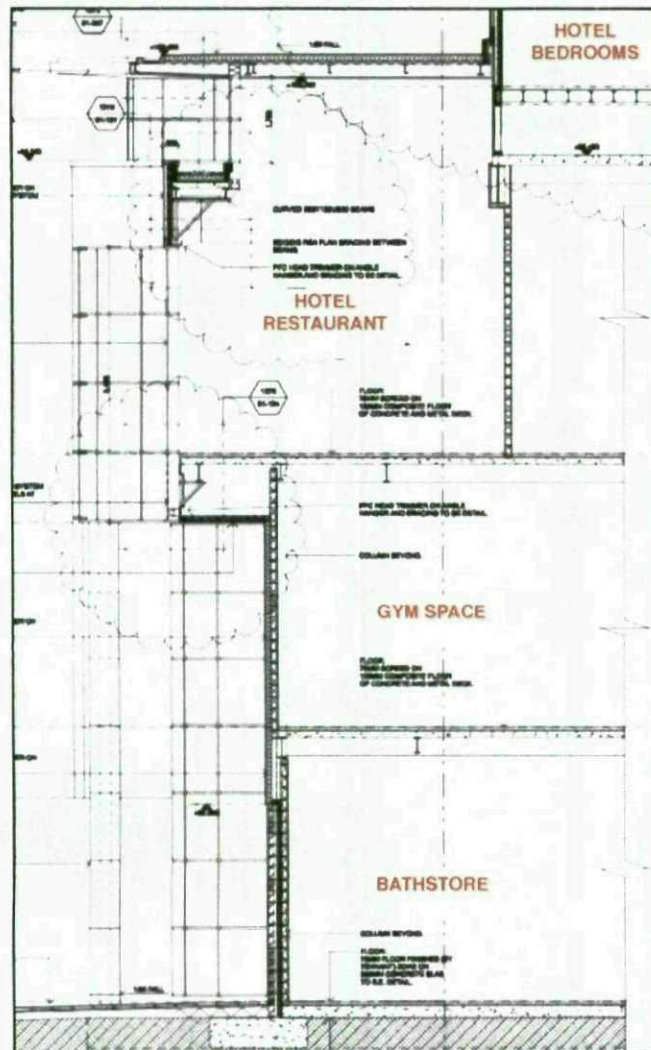


Figure 4 below indicates a section of the building and the location of nearby receptors.

Figure 4: Existing Section



Proposed Opening Times

It is anticipated that the gym will open over a 24 hour period with staffed hours between 8am and 8pm Monday to Friday.

Fixed Plant Items

At this early design stage no further details on the proposed plant items are available.

3.0 TARGET ACOUSTIC CRITERIA

Building Regulations

In accordance with the requirements of Approved Document E the base build elements separating a gym unit from residential spaces shall achieve an airborne sound reduction performance of at least the minimum Building Regulations Approved Document E performance standards. This equates to a requirement of at least $D_{nT,w} + C_w$ 45 dB. There is no direct adjacency between the residential hotel spaces and the gym unit, therefore this standard is not applicable.

Landlord's Specification

The following requirements are set by the Landlord's Specification for the proposed gym units.

7.6 *Without prejudice to the above Clause 7.5, the Tenant shall not at any time cause and shall not permit loud noise which constitutes an actionable nuisance to emanate from the Premises.*

7.6.3 *Not to install or use any fitness equipment or multiple arrangement of fitness equipment that would transfer a continuous resonance frequency above 5.4 Hz in the vertical mode to the building structure and if the Landlord (acting reasonably) considers that such resonance frequency is being transferred to the building structure, such frequency transfer being measured in adjoining units by a corporate member of the Noise and Vibration Engineering Group affiliated to the Institute of Acoustics, then the Tenant will in the first instance undertake such attenuation measures as the Tenant believes (in its reasonable opinion) are suitable to minimise such frequency transfer. If, following such remediation works the Landlord (acting reasonably) considers such measures are insufficient or ineffective then the Landlord may commission an independent study of the offending equipment's normal use by a corporate member of the Noise and Vibration Engineering Group affiliated to the Institute of Acoustics and the tenant will comply with any findings and recommendations that exceed criteria set out in British Standard BS6472 & BS 6399 Part 1 Annex A to ensure that vibration transfer in the vertical axis is controlled, the cost of such report to be shared equally between the tenant and the landlord, with the cost of any rectification works or measures being at the cost of the tenant.*

The assessment undertaken by Red Acoustics is based on these target criteria.

4.0 DETERMINATION OF OPERATING NOISE LEVELS

In order to establish typical operating music / activity noise levels within the proposed gym spaces, reference is made to historical noise measurements undertaken by Red Acoustics inside gym spaces during a busy daytime period with music reproduction.

Details of typical music and activity noise levels are presented in Table 2 below.

Table 2: Music / Activity Noise L_{eq} Spectra

Operating Condition	Measured $L_{eq,1m-5m}$ Noise Spectra, dB re 2×10^{-5} Pa						
	63	125	250	500	1k	2k	4k
Gym Areas Music & Activity	69	76	77	76	75	72	64

5.0 SOUND INSULATION TEST PROCEDURE & RESULTS

Airborne Sound Insulation

Airborne sound insulation testing was carried out in accordance with the requirements of the BS EN ISO 140-4:1998: "Field Measurements of Airborne Sound Insulation between Rooms" in order to determine the level difference, D , between the proposed gym unit and the existing residential spaces. Where

$$D = L_1 - L_2$$

and

L_1 is the average sound pressure level in the source room

L_2 is the average sound pressure level in the receiving room

To conduct airborne sound insulation tests, a pink noise source is placed in the "source room" and the resultant noise level (L_{eq}) in this room is measured at fixed positions. The room on the other side of the party construction is the "receiver room" and the noise transmitted to this room is measured at fixed positions.

The background ambient (L_{eq}) noise levels was recorded in the receiver room with the sound source turned off and during lulls in external traffic activity.

All of the above measurements were made in one-third octave bands from 50Hz to 5,000 Hz inclusive.

The differences between source and receiver third octave band noise levels were then calculated in accordance with BS EN ISO 140-4: "Field Measurements of airborne sound insulation between rooms" and corrected for background noise. No corrections have been made for the reverberant conditions in the residential space as the existing finishes and fixtures are deemed to be representative of an occupied space.

Shock Vibration Transfer

To assess the transfer of free weight shock vibration from the gym unit to the adjacent residential spaces, residual impact noise levels were measured within noise sensitive spaces during controlled free weight drops in the gym unit using a 35kg dumbbell onto different resilient floor types. The 35kg Dumbbell was dropped from a height of 0.5m for each measurement. This provided a representative assessment for other free weight shock loads on the building structure.

Noise & Vibration Transfer Tests

To assess the transmission of music and activity noise, and free weight shock vibration from the gym units to the existing residential spaces and determine compliance with the target shell criteria, airborne sound insulation tests were carried out between the spaces as identified in Table 3.

Table 3: Noise Transfer Measurements

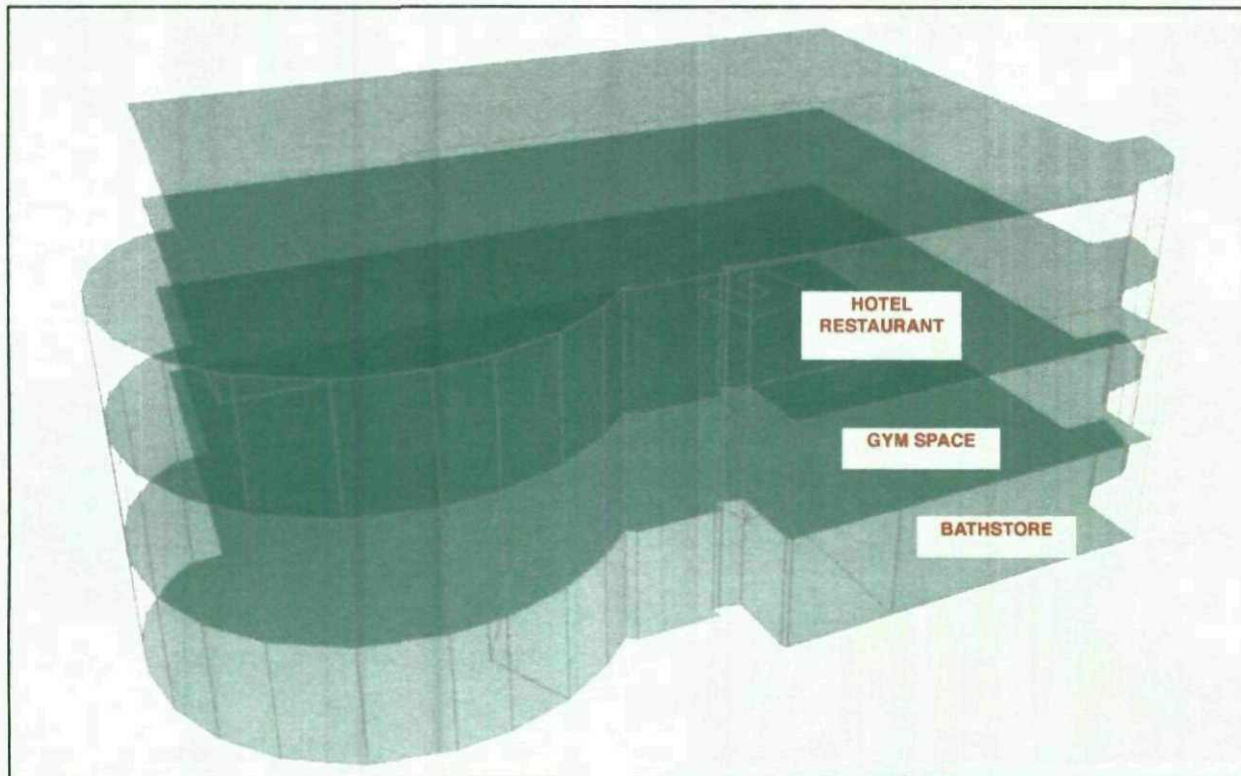
Source Room	Receiving Room	Source Type	Assessment
First Floor Gym Space	Bathstore	Pink Noise	Detailed Below
First Floor Gym Space	Bathstore	35kg Dumbbell Drop in Resistance Area	Detailed Below
First Floor Gym Space	Premier Inn Restaurant	Pink Noise	Detailed Below
First Floor Gym Space	Premier Inn Restaurant	35kg Dumbbell Drop in Resistance Area	Detailed Below
First Floor Gym Space	Premier Inn Laundry Space Adjacent to Hotel Bedrooms	Pink Noise	Held On File - No Adverse Impact Detected
First Floor Gym Space	Premier Inn Laundry Space Adjacent to Hotel Bedrooms	35kg Dumbbell Drop in Resistance Area	Held On File - No Adverse Impact Detected
First Floor Gym Space	TK Maxx	Pink Noise	Detailed Below
First Floor Gym Space	TK Maxx	35kg Dumbbell Drop in Resistance Area	Detailed Below

10.0 INTERNAL NOISE IMPACT ASSESSMENT

Measured vs Predicted Shell Performance

Using data from the measured noise and vibration transfer measurements and a knowledge of the separating constructions and flanking elements, a 3D noise transfer model has been developed using advanced visual software in accordance with BS 12354 to determine a cost effective scheme of fit-out measures. A 3D view of the noise transfer model is shown in Figure 5.

Figure 5: Noise Transfer Model



Internal Noise & Vibration Transfer

Based on the results of the sound insulation tests and the measured music and activity noise levels, an assessment has been undertaken to determine the transfer and propagation of noise from the proposed gym units to the existing noise sensitive spaces.

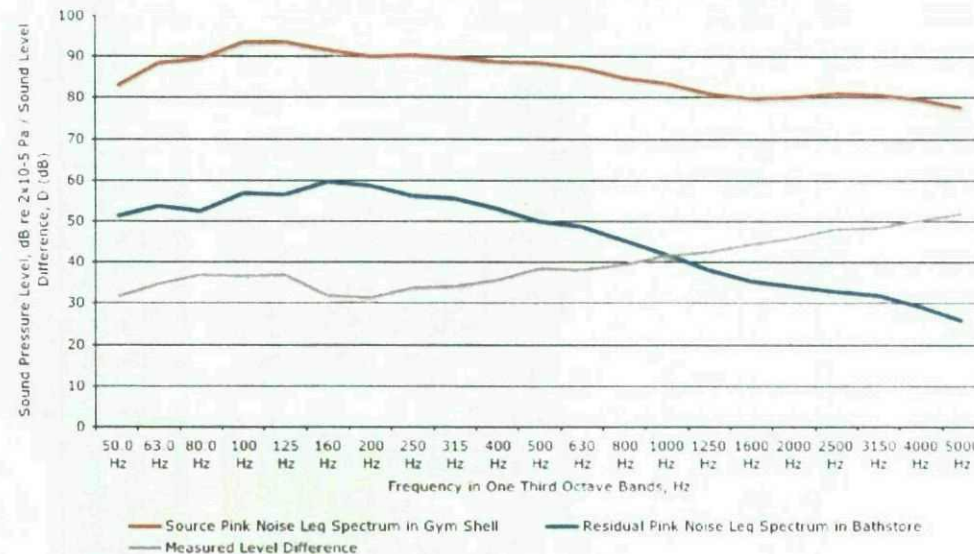
To assess impact from normal operation of the proposed gym and develop cost effective fit-out measures for compliance with the target criteria, a noise transfer assessment has been undertaken by Red Acoustics using the 3D noise transfer model based on the following information:

- Noise and vibration transfer measurements taken on site between the shell unit and residential spaces above
- Knowledge of existing separating and flanking structures
- Knowledge of the acoustic performance of fit-out elements including ceilings, wall linings and resilient floor treatments
- Database on typical source noise levels within the gym spaces

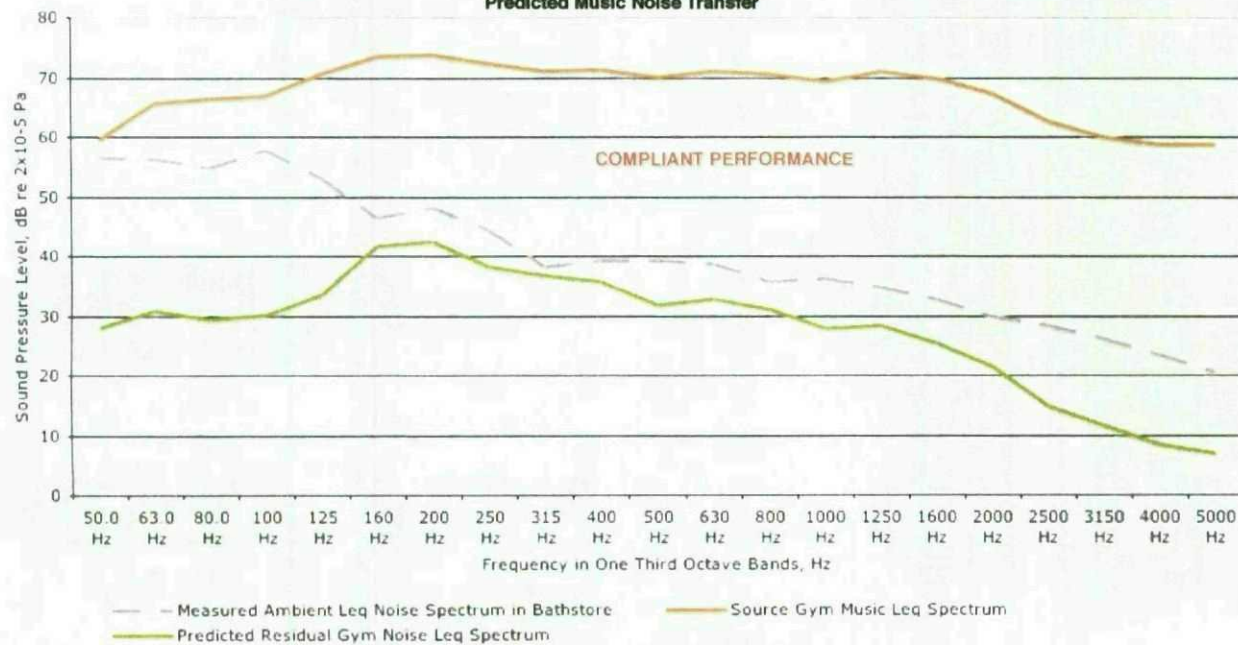
Level 1 Gym Area to Bathstore - Noise Transfer



Measured Sound Insulation Performance



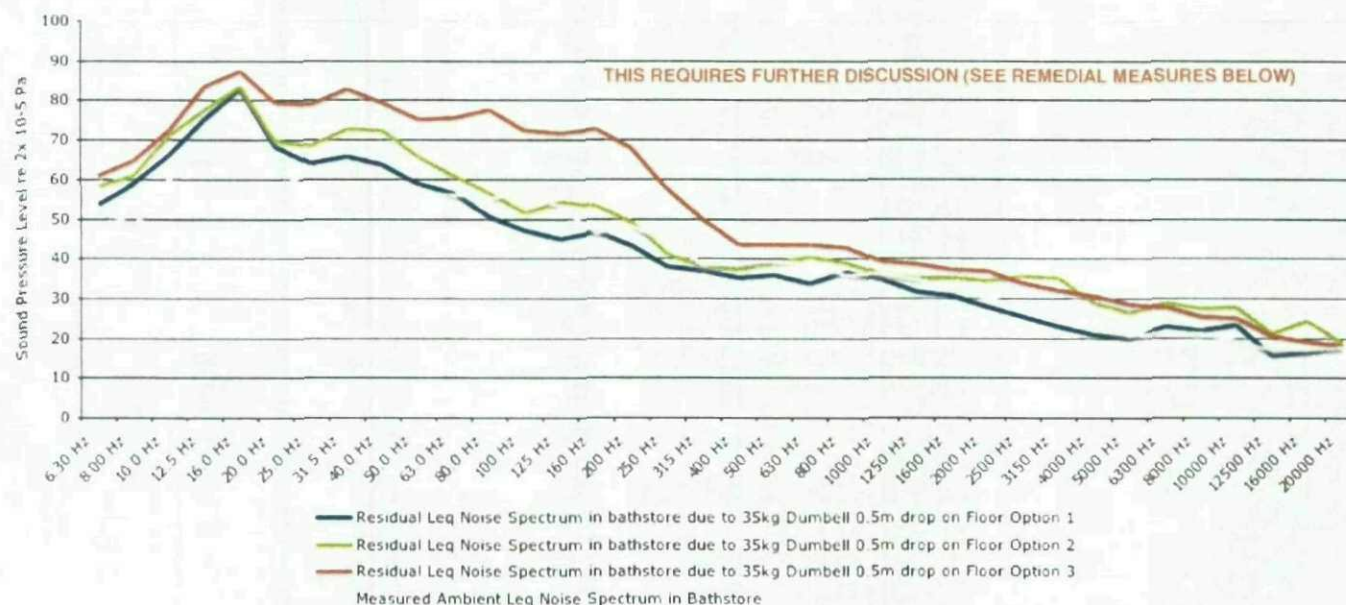
Predicted Music Noise Transfer



Observations

- Reasonable performance provided by the shell with enhanced screeded floor
- No ceiling installed in The Bathstore
- Shortfall in measured performance at 200Hz is due to the ongoing works to the staircase bulkhead. This performance is expected to improve once the remedial measures are complete,

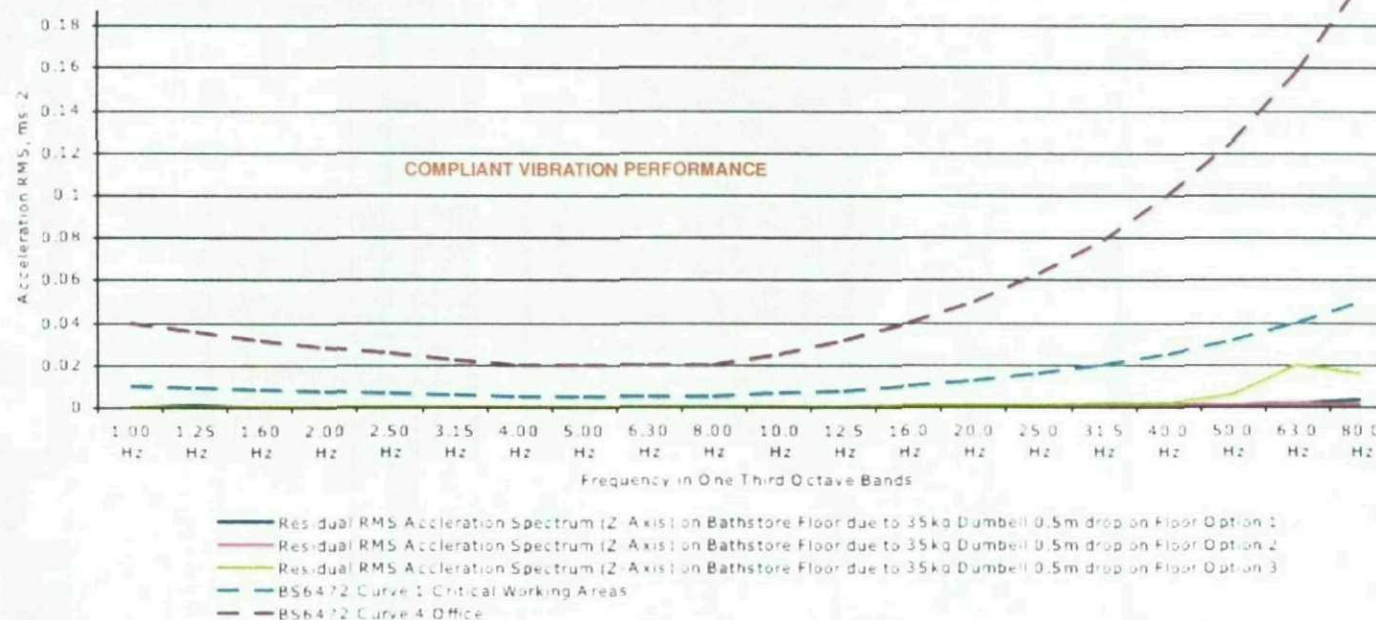
Level 1 Gym Area to Bathstore - Impact Noise Transfer



Observations

- For Floor Options 2 and 3, the residual impact noise was clearly audible in the Bathstore. This performance was limited by the omission of a ceiling in the Bathstore Space.
- The residual impact noise was markedly improved when assessing floor Option 1, although low frequency noise impact was still audible as a "thud" during lulls in traffic.
- The residual vibration levels were compliant with the target VDV criteria defined in BS6472: 2008 and below the threshold of perception curve (Curve 1) for vertical axis vibration (in accordance with BS6472: 1992).

Tri-Axial Vibration Accelerometer Mounting on Spiked Floor DIN Baseplate



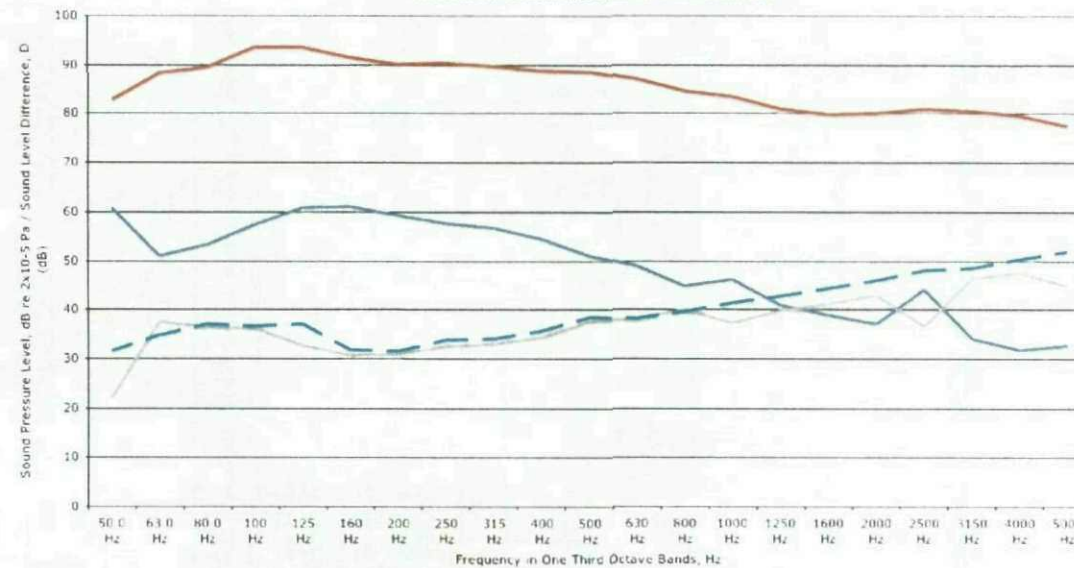
Level 1 Gym to Premier Inn Restaurant - Noise Transfer



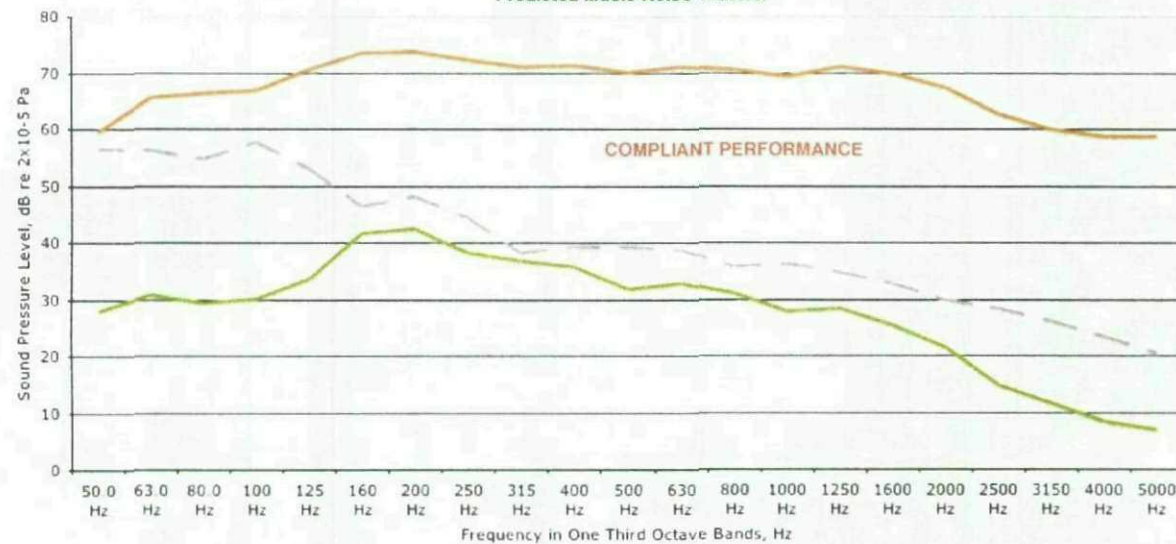
Observations

- Reasonable performance provided by the shell
- The performance at high frequency is limited by flanking transmission in the curved curtain walling system

Measured Sound Insulation Performance

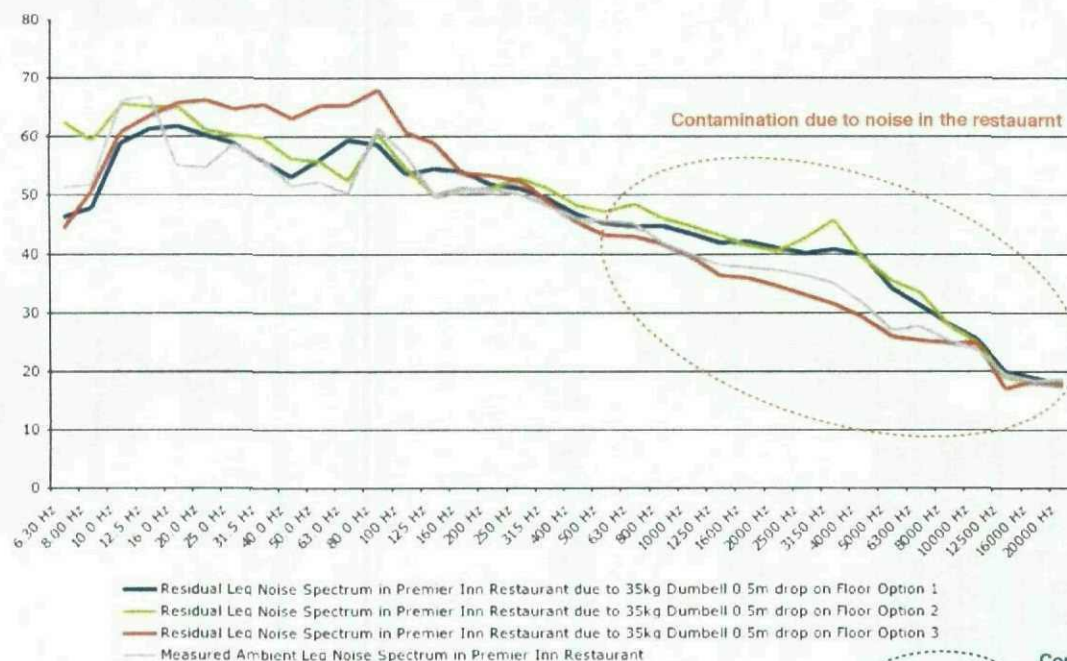


Predicted Music Noise Transfer



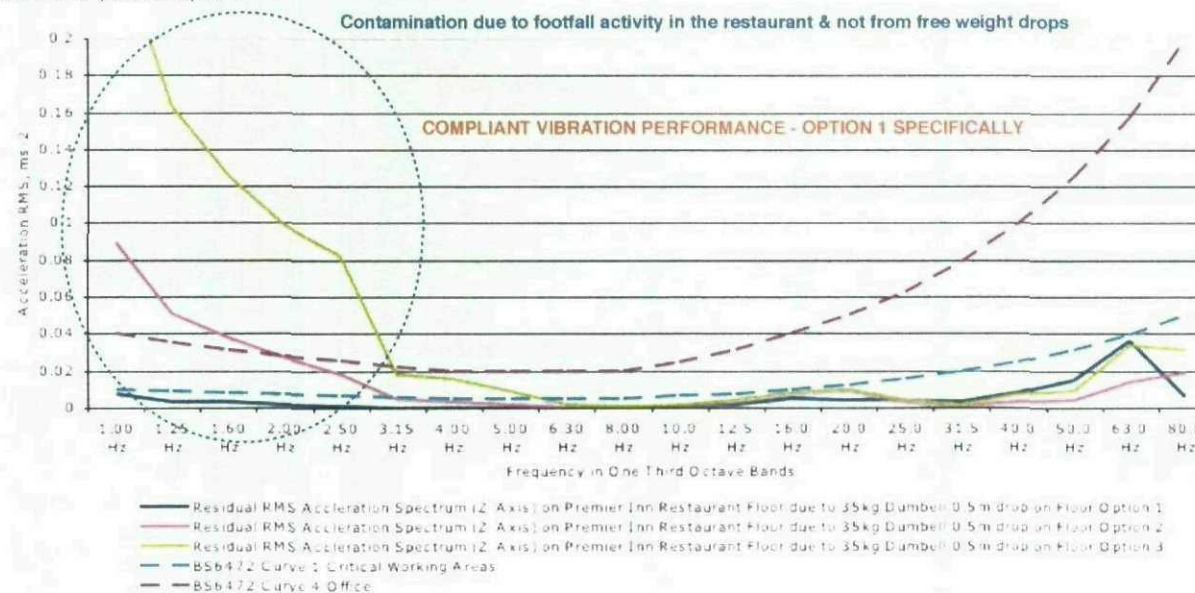
- Measured Ambient Leq Noise Spectrum in Bathstore
- Source Gym Music Leq Spectrum
- Predicted Residual Gym Noise Leq Spectrum

Level 1 Gym to Premier Inn Restaurant - Impact Noise Transfer

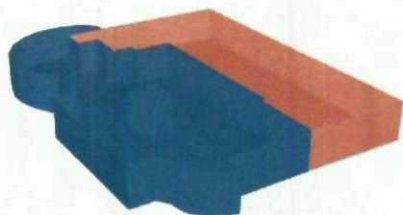


Observations

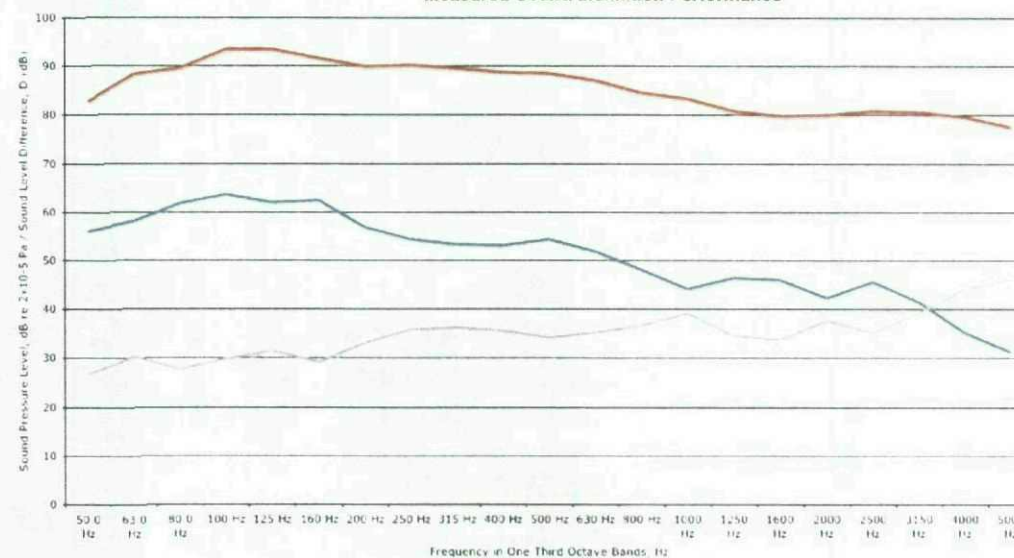
- For Floor Option 3, the residual impact noise was audible in the Premier Inn Restaurant.
- The residual impact noise was markedly improved when assessing floor Options 1 & 2.
- Floor Option 1 was deemed to be acceptable
- The residual vibration levels were compliant with the target VDV criteria defined in BS6472: 2008 and below the threshold of perception curve (Curve 1) for vertical axis vibration (in accordance with BS6472: 1992).



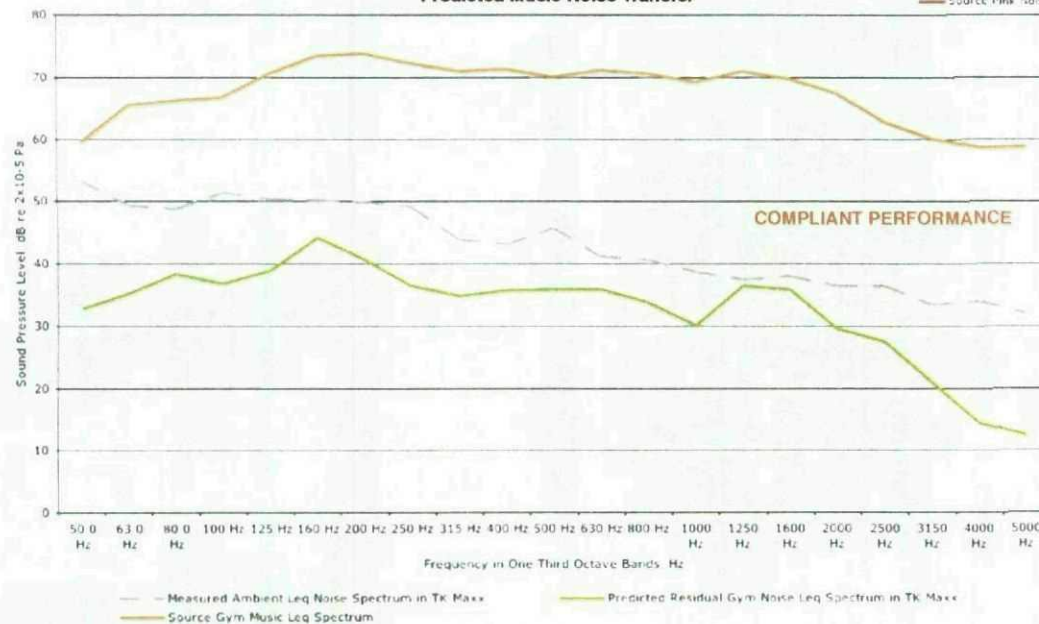
Level 1 Gym to TK Maxx - Noise Transfer



Measured Sound Insulation Performance



Predicted Music Noise Transfer



Observations

- Reasonable performance provided by the shell
- The performance at high frequency is limited by flanking transmission via gaps at the head of the blockwork separating wall - remedial measures are detailed below

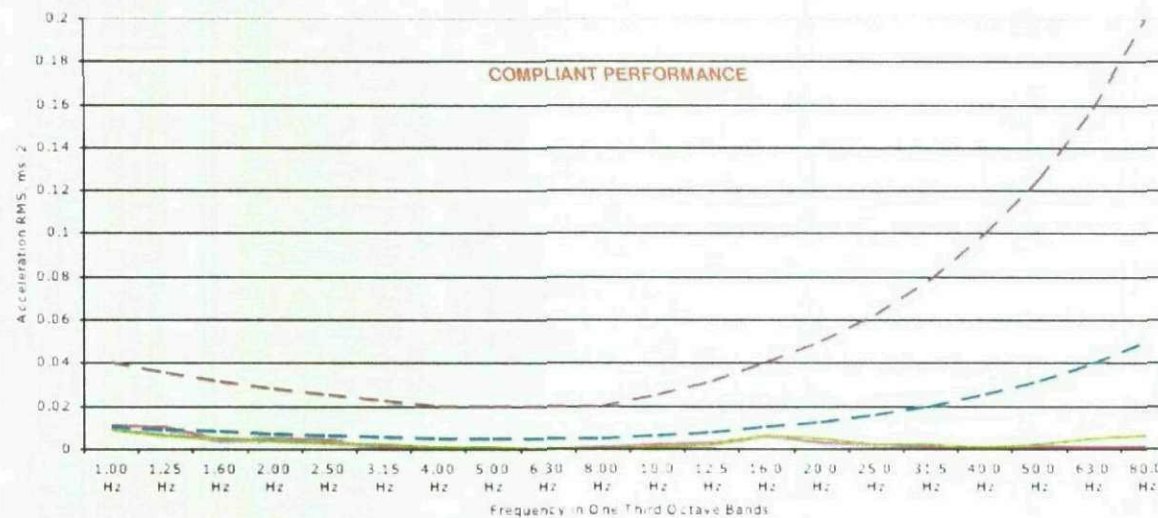
Level 1 Gym to TK Maxx - Impact Noise Transfer



— Residual Leq Noise Spectrum in TK Maxx due to 35kg Dumbbell 0.5m drop on Floor Option 2
— Residual Leq Noise Spectrum in TK Maxx due to 35kg Dumbbell 0.5m drop on Floor Option 3
— Measured Ambient Leq Noise Spectrum in TK Maxx

Observations

- For Floor Option 2, the residual impact noise was inaudible in TK Maxx
- Further improvements are expected using Option 1 although this was not tested in TK Maxx due to store closing times
- Floor Option 1 is deemed to be acceptable
- The residual vibration levels were compliant with the target VDV criteria defined in BS6472: 2008 and below the threshold of perception curve (Curve 1) for vertical axis vibration (in accordance with BS6472: 1992).



— Residual RMS Acceleration Spectrum (Z-Axis) on TK Maxx Floor due to 35kg Dumbbell 0.5m drop on Floor Option 2
— Residual RMS Acceleration Spectrum (Z-Axis) on TK Maxx Floor due to 35kg Dumbbell 0.5m drop on Floor Option 3
— BS6472 Curve 1 Critical Working Areas
— BS6472 Curve 4 Office

Fit-Out Measures

For compliance with the target criteria, a scheme of remedial measures are given below.

Blockwork Wall Head Infill Details

Infill all gaps at the head of the blockwork walls on the perimeter of the gym space with either acoustic mastic or expanding foam. Where the floor profile runs perpendicular to the line of wall (as shown below seal the profiled infills with expanding foam).



Suitable foam products include:

TVS dB Expanding Foam

Total Vibration Solutions

Tel: 01706 260 220

Exton EX240 Acoustic/Intumescent Foam

Exton UK

Tel: Tel: 01489 788 909

Floor Proposals

The resilient / acoustic flooring proposals are given in Table 4 below.

Table 4: Flooring Proposal

Level	Area	Acoustic Floor Type	Floor Finish
Level 1 Gym	Cardio Training	As proposed floor finish + resilient pads under all treadmills (see below)	Finish A - Modulys Carpet
Level 1 Gym	Guest Lobby / member Lobby	As proposed floor finish	Finish C - LG Hausys Decile
Level 1 Gym	Free Weights	Floor Treatment + FT1 (see below)	Finish D - Everroll
Level 1 Gym	Resistance	Floor Treatment + FT1 (see below)	Finish A - Modulys Carpet
Level 1 Gym	Changing	As proposed floor finish	Finish B- Porcelain Tiled Floor
Level 1 Gym	Office / PT Office	As proposed floor finish	Finish A - Modulys Carpet
Level 1 Gym	Tanning	As proposed floor finish	Finish C - LG Hausys Decile
Level 1 Gym	WC	As proposed floor finish	Finish F - Porcelain Tiled Floor

Floor Treatment FT1 (Max. Height 111mm):

Everroll floor finish (Free Weights Area) / Carpet Floor Finish (Resistance Area) on

15mm TVS VIBSorb 20 over

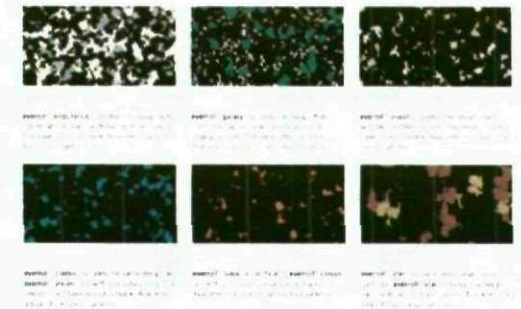
18mm Plywood over

2x12.5mm SoundBloc

18mm Plywood over

TVS 125mm x 25mm Sorbothane 70 Rings

TVS VIBsorb 20



All Scream Perimeter Edges Fitted With a Flanking Band of 17mm VibSorb 10 to Avoid Bridging to Flanking Walls & Columns

IT SHOULD BE NOTED THAT THE FLOOR PROPOSAL FT1 WILL RESULT IN AUDIBLE IMPACT NOISE EVENTS IN THE BATHSTORE BELOW. THIS MAY RESULT IN A PERCEIVED NUISANCE DURING HIGH IMPACT EVENTS.

FURTHER IMPROVEMENTS CAN ONLY BE ACHIEVED BY PROVIDING A JACK UP CONCRETE FLOOR SLAB WHICH CANNOT BE INSTALLED DUE TO STRUCTURAL LIMITATIONS OF THE BUILDING. ALTERNATIVE OPTIONS INCLUDE THE PROVISION OF AN ACOUSTIC CEILING IN THE BATHSTORE OR A RAISED STEEL RAFT FLOOR FIXED TO THE EXISTING FRAME USING SHOCK REDUCING WIRE ROPE ISOLATORS. BOTH OPTIONS ARE NOT DEEMED TO BE VIABLE FOR COST PURPOSES OR DELIVERY TIMESCALES. THIS REQUIRES FURTHER DISCUSSION.

Treadmill Isolation Pads

A number of treadmill isolation pads are being investigated by Red Acoustics to assess performance vs cost. Suitable products will be recommended subject to the weight of the proposed treadmills. This information will follow.

Other Noise Control Measures

The following noise control measures are also proposed for the fit-out to ensure protection of nearby noise sensitive properties:

- Fit all entrance and emergency doors with good quality acoustic door seals to all perimeters, meeting stiles and thresholds (where practical). Suitable acoustic door seals include the Integrity Acoustic Door Seal Range available from Lorient Polyproducts Ltd (Tel: 01626 834 252).
- Install a frequency controlled music noise limiter to the primary music systems so that the internal music noise levels at all frequencies can be calibrated after completion of all remedial works to enable maximum allowable music noise levels to be set in line with the target requirements.
- The music noise limiter should have the capacity to be set and locked. It is recommended that if this system is used, only the supplier of the AV system, Red Acoustics and/or the Local Authority should have access to the password.
- The exposed SVP's within the gym unit should be wrapped with a mass barrier to minimise water noise egress and music activity noise ingress. Suitable details will be provided by Red Acoustics.
- Consideration must also be given by the landlord for providing suitable acoustic seals to all pipe penetrations to maintain the acoustic integrity of the floor.

APPENDIX A: TEST DETAILS & CALIBRATION CERTIFICATES

Location

Riverside

Hemel Hempstead

Date of Tests

8 June 2011

Tests Conducted By

Simon Webster BEng(Hons) MIOA & Ian Etchells BEng(Hons) MIOA

Red Acoustics Limited, Suite 3 Cottam Lane Business Centre, Cottam Lane, Preston, PR2 1JR

Associate Members of the Association of Noise Consultants

Accredited Test Organisation Number 180



Instrumentation Used

Table A1: List of Instrumentation Used

Equipment Description	Type Number	Manufacturer	Serial Number	Date of Last Calibration	Calibration Certificate Number
4 Channel Sound and Vibration Analyser	SVAN 958 Type 1	SVANTEK	20894	16 th May 2011	Factory
Sound Calibrator	Type 1251 IEC 60942-19 97 Class 1	Norsonic	31040	25 th August 2010	7441
Tri-Axial Accelerometer	PCB 356B18 1mV/g	PCB Piezotronic	113409	22 April 2011	Factory

Calibration Procedure

Before and after the measurements the SAVN 958 was check calibrated to an accuracy of $\pm 0.3\text{dB}$ using the Norsonic Type 1251 Sound Calibrator. The calibrator produces a sound pressure level of 114 dB re 2×10^{-5} Pa @ 1kHz.



ISO9001 certified

FACTORY CALIBRATION DATA OF THE SVAN 958 No. 20894

SOUND LEVEL METER

1. CALIBRATION (electrical)

LEVEL METER, Filter: LN, Input signal: +114 dB, f_{ref} = 1kHz

	Range 104dB		Range 139dB	
	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]
Channel 1	113.99	-0.01	114.00	0.00
Channel 2	113.99	-0.01	114.00	0.00
Channel 3	113.99	-0.01	114.00	0.00
Channel 4	113.99	-0.01	114.00	0.00

2. CALIBRATION (acoustical)

LEVEL METER, Range: 130 dB, Reference frequency: 1000 Hz

Filter	LN		A		C	
	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]
Channel 1	113.9	0.1	113.5	0.5	113.5	0.5
Channel 2	113.9	0.1	113.5	0.5	113.5	0.5
Channel 3	113.9	0.1	113.5	0.5	113.5	0.5
Channel 4	113.9	0.1	113.5	0.5	113.5	0.5

Calibration measured with the microphone SVANTEK type SV27 No. 809479. Calibration factor: -2.80

3. LINEARITY TEST (electrical)

LEVEL METER, Range: 105 dB, Filter: A, f_{ref} = 1000 Hz

	Input [dB]	24.0	25.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0	110.0	114.0
Channel 1	Error [dB]	0.15	0.10	0.12	0.01	0.01	-0.02	0.01	0.00	0.01	0.01	0.01
Channel 2	Error [dB]	0.15	0.10	0.12	0.01	0.01	-0.02	0.01	0.00	0.01	0.01	0.01
Channel 3	Error [dB]	0.15	0.10	0.12	0.01	0.01	-0.02	0.01	0.00	0.01	0.01	0.01
Channel 4	Error [dB]	0.15	0.10	0.12	0.01	0.01	-0.02	0.01	0.00	0.01	0.01	0.01

LEVEL METER, Range: 130 dB, Filter: A, f_{ref} = 1000 Hz

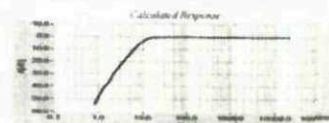
	Input [dB]	85.0	90.0	95.0	100.0	105.0	110.0	120.0	130.0	135.0
Channel 1	Error [dB]	0.01	0.00	0.03	-0.01	0.00	0.00	0.00	0.01	0.01
Channel 2	Error [dB]	0.01	0.00	0.03	-0.01	0.00	0.00	0.00	0.01	0.01
Channel 3	Error [dB]	0.01	0.00	0.03	-0.01	0.00	0.00	0.00	0.01	0.01
Channel 4	Error [dB]	0.01	0.00	0.03	-0.01	0.00	0.00	0.00	0.01	0.01

1/3 OCTAVE (1/3) Range: 130 dB, Filter: A, f_{ref} = 1000 Hz

	Input [dB]	15.0	40.0	60.0	80.0	100.0	120.0	140.0	160.0	180.0
Channel 1	Error [dB]	0.12	0.01	0.07	0.04	-0.01	0.01	0.00	0.00	0.01
Channel 2	Error [dB]	0.12	0.01	0.07	0.04	-0.01	0.01	0.00	0.00	0.01
Channel 3	Error [dB]	0.12	0.01	0.07	0.04	-0.01	0.01	0.00	0.00	0.01
Channel 4	Error [dB]	0.12	0.01	0.07	0.04	-0.01	0.01	0.00	0.00	0.01

6. FREQUENCY RESPONSE (electrical)

LEVEL METER, Filter: Z, Range: 130 dB, Input signal: -135 dB



Measured Response (Frequency: 400 Hz) in (dB) at

110dB	120dB	130dB	140dB	150dB	160dB	170dB	180dB	190dB	200dB
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
3.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
4.0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
5.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
6.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
7.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
8.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
9.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
10.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

All frequencies are normal values for the 1/3 octave bands.

50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

7. INTERNAL NOISE LEVEL (electrical)

LEVEL METER, Range: 105 dB, Back-light: off, Calibration factor: 0.0

LEVEL METER, Range 70 to 150 dB, Black-light - 0.01, Calibration factor 0.01				
	Filter	Z	A	C
Channel 1	Level [dB]	12.5	12.3	10.4
Channel 2	Level [dB]	16.8	16.3	13.4
Channel 3	Level [dB]	14.9	14.2	12.5
Channel 4	Level [dB]	14.1	13.1	11.4

* measured with preamplifier SVANTEK type SV12 No. 1992

VIBRATION LEVEL METER

1. CALIBRATION (electrical)

LEVEL METER, Filter: HP10, Input signal: -140 dB, f_{ref} = 70.0 Hz

	Range 145dB		Range 170dB	
	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]
Channel 1	145.00	0.00	145.00	0.00
Channel 2	145.00	0.00	145.00	0.00
Channel 3	145.00	0.00	145.00	0.00
Channel 4	145.00	0.00	145.00	0.00

2. CALIBRATION (vibrational)

LEVEL METER, Range: 145 dB, Input signal: 120 dB

Filter	HP10		HP10		Wz		Wm		Wh	
	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]
Channel 1	120.3	0.3	120.3	0.3	108.4	0.3	108.1	0.0	115.1	0.0
Channel 2	120.3	0.3	120.3	0.3	108.4	0.3	108.1	0.0	115.1	0.0
Channel 3	120.4	0.4	120.3	0.3	108.4	0.3	108.1	0.0	115.1	0.0
Channel 4	120.4	0.4	120.3	0.3	108.4	0.3	108.1	0.0	115.1	0.0

Calibration measured with the accelerometer DYTRAN type 118D No. 2973. Calibration factor: -4.44 dB