



PureGym – Unit 2,
Neath Retail Park,
Neath

Acoustic Feasibility Report

Reference: 13484.RP01.001.0

Prepared: 4 April 2024

Revision Number: 0

PureGym

Town Centre House
Merrion Centre
Leeds
LS2 8LY





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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	4 April 2024	Patrick Spiers	Martin Raisborough

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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed into full working drawings by the lead designer to incorporate all other design disciplines.



LONDON
44 Borough Road
London SE1 0AJ
T. +44 (0) 20 7620 1950

MANCHESTER
Bloc, 17 Marble Street
Manchester, M2 3AW
T. +44 (0) 161 661 4504

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1.0 EXECUTIVE SUMMARY

RBA Acoustics has been appointed by PureGym to undertake an acoustic feasibility study for a potential new PureGym facility at Unit 2 Neath Retail Park, Neath in Wales. The proposed unit is a detached unit located off Golwg-y-Gamlas.

This report presents the details and outcomes of airborne noise breakout testing from the building and impacting on the nearby noise sensitive properties undertaken by RBA Acoustics on Wednesday 27th March 2024, the purpose of which are to provide guidance to PureGym with respect to the feasibility of accommodating a gym within the proposed unit from an acoustics perspective.

Based on the results of sound insulation testing of the external wall facing the noise sensitive dwellings, and a subsequent assessment of likely noise breakout from Gym activities, noise associated with gym activities during typical later evening periods (up to around 21:00 where formal class activities will be taking place) is expected to be at least 5dB below the otherwise prevailing ambient sound level at the façade of the nearest affected noise sensitive properties at the majority of frequencies. Based on this, it is not expected that there will be any impact due to noise and no mitigation measures are, therefore, considered necessary.

With regards to the southeastern façade wall, which contains an acoustic weakness of a roller door, noise from activities associated with Studio and Spin Studio classes are expected to exceed to recommended criterion of at least 5dB below the otherwise prevailing ambient sound level at the façade of the nearest affected noise sensitive properties. As such, if the Studio/Spin Studio of the Gym is to be located near the southeastern façade wall, close to the roller shutters, it is recommended that mitigation measures are implemented to control airborne sound transmission to the nearest residential dwellings as detailed in Section 0 of this report.

2.0 INTRODUCTION

RBA Acoustics has been appointed by PureGym to undertake an acoustic feasibility study for a potential new PureGym facility at Unit 2 Neath Retail Park, Neath in Wales. The proposed unit is a detached unit located off Golwg-y-Gamlas.

This report presents the details and outcomes of airborne noise breakout testing from the building and impacting on the nearby noise sensitive properties undertaken by RBA Acoustics on Wednesday 27th March 2024, the purpose of which are to provide guidance to PureGym with respect to the feasibility of accommodating a gym within the proposed unit from an acoustics perspective.

This report occasionally employs technical acoustic terminology. In order to assist the reader, a brief description of the acoustic parameters used in this report is included within Appendix A.

3.0 GYM NOISE & VIBRATION CRITERIA

The most appropriate reference document that consider the issue of noise and vibration associated with Gym activities is the Gym Acoustics Guide published by the Association of Noise Consultant (ANC) in June 2023. The testing methods described in this document have been generally adopted in the acoustic tests performed on this site.

The document also outlines suggested acoustic criteria for various neighbouring occupancies and uses. These criteria have been considered in parallel with PureGym's standard acoustic requirements, which are presented in Table 1 below. From previous projects, these levels have been found to correlate well with user acceptability of noise in adjacent retail demises and are considered to minimise the likelihood of future complaints.

Table 1– Internal Noise Level Target Criteria

Internal Noise Levels Due to Gym Activity Noise	Target Criteria		
	Airborne (music etc.), $L_{eq, T}$	Weight Impact Radiated Noise, $L_{max, fast}$	Tactile Vibration (point of entry to the body) RMS Acceleration (mm/s ²)
Commercial Offices	NR30	NR40 (31.5Hz to 8kHz)	Curve 4 according to BS 6472:1992*
Retail Areas	NR35	NR45 (31.5Hz to 8kHz)	Curve 8 according to BS 6472:1992*
Residential Areas	NR15 (day) NR10 (night)	NR20 (31.5Hz to 8kHz) – 07:00-23:00 (day) NR15 (31.5Hz to 8kHz) – 23:00-07:00 (night)	Curve 1.4 according to BS 6472:1992* (This limit is given for night-time periods, which represents the worst-case period)

* Note: 1992 version of this standard is now superseded but is still considered relevant for this application

In areas with low background noise levels, it has been noted that the subjective impression of low frequency noise can still cause issues of disturbance, despite meeting the above targets. Therefore, based on our experience, we also recommend that resulting impact noise levels at frequencies 80Hz and below do not exceed a level of 20dB above the otherwise existing background sound level within commercial and retail adjacencies.

For residential adjacencies, we recommend that resulting impact noise levels do not exceed a level 10 dB above the otherwise existing background sound level at frequencies 80Hz and below.

3.1 Activity Noise Levels

Table 2 below presents the results of typical activity noise within a PureGym unit, based on measurements undertaken by RBA Acoustics at similar facilities across the UK.

Table 2– PureGym Activity Noise Levels

Space	Sound Pressure Level (L_{eq} , dB re 20×10^{-6} Pa.) @ Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Studio / Spin Studio - Group Class	85	85	84	88	85	80	73	70	90
Functional Area -Group Class	68	74	71	74	74	68	65	62	77
Main Gym Floor (Daytime)	68	67	67	68	66	63	61	57	71
Main Gym Floor (Night)	62	65	64	62	60	58	56	51	66

The above data will be used in subsequent analysis to predict likely levels of noise transfer to the unit below and to determine the need and extent of any mitigation measures required to comply with the guideline criteria in Table 1.

3.2 Noise Breakout to Nearby Noise Sensitive Properties

In order that noise breakout from the unit due to amplified music and speech during formal class activities does not adversely impact on the nearest affected noise sensitive property, it is recommended that the L_{Aeq} noise level of the breakout sound does not exceed a level 5dB below the otherwise ambient L_{Aeq} sound level in any 1/3 octave band at the façade of the nearest affected noise sensitive property.

In addition to the above, there may be a planning requirement from the Local Authority in relation to the control of noise breakout from the unit. RBA Acoustics should be informed if any planning requirement exists and differs from the above, so we may update our recommendations as appropriate.

4.0 DETAILS OF SITE INVESTIGATIONS

In order to investigate the issues of noise associated with activities within the proposed PureGym unit, a site visit was undertaken by Martin Raisborough (BEng^{Hons}, MIOA) and Patrick Spiers (MSc, AMIOA) of RBA Acoustics on Wednesday 27th March 2024.

The proposed PureGym unit is within a standalone retail unit, currently tenanted by 'What!', a budget goods store. Halfords Neath is located in an adjacent unit to the south west of the proposed Gym unit, across the main car park area. The Neath and Brecon railway line and the Tenant Canal are located to the south of the site.

The site is located in a mixed commercial and residential area. The closest noise sensitive properties to the site are located to the northeast, along Golwg-y-Gamlas. These properties are dwellings of 2No. storeys in height.

The location of the site is shown in the plan in Figure A in Appendix B. Currently, there are no proposed layout plans for the proposed PureGym unit, and as such we have assumed worst-case positioning of relevant spaces for our assessments below.

The external façade of the unit is noted to be blockwork up to circa 2.5 metres, with lightweight composite cladding above, and a lightweight composite roof. Along the southeastern façade, there is a small roller shutter door for loading of goods. There façade constructions are highlighted in Figure 1 and Figure 2 below.

Figure 1 - External Façade Constructions I



Figure 2 – External Façade Constructions II



The equipment used to undertake the tests is presented in Appendix C. The equipment was calibrated before and after the tests using the field calibrators. No drift in calibration was observed.

The sound level meters have been calibrated within the past 2 years, while the field calibrators have themselves been laboratory calibrated within the past year. Calibration certificated for all equipment are available on request.

The details and results of the various tests are presented in turn in the following sections.

5.0 AIRBORNE NOISE BREAKOUT TO THE ENVIRONMENT

A number of residential dwellings are located in relatively close proximity to the unit (approximately 32 metres), on the opposite side of Golwg-y-Gamlas to the Neath Retail Park site. As such, there is the potential for noise breakout due to activities within the PureGym demise to adversely impact on these dwellings. The proximity of the dwellings is shown below in Figure 3.

Figure 3 – Dwellings close to the Pure Gym demise, along Golwg-y-Gamlas



To the rear of the site there is a steep embankment that provides some screening to these dwellings as showing in Figure 4 below.

Figure 4 – Separating Embankment between Pure Gym demise & Dwellings



Airborne sound insulation testing of the rear external wall of the proposed PureGym Unit facing the was undertaken in general accordance with BS EN ISO 16283-1:2014+A1:2017 “Acoustics. Field measurement of sound insulation in buildings and of building elements. Airborne sound insulation” and the results have been rated in accordance with BS EN ISO 717-1:2013 “Acoustics. Rating of sound insulation in buildings and of building elements” in order to determine the single figure D_w performance.

The full results of the test are presented in Appendix D (Test A). The single figure result of the test is 39dB D_w .

An additional test of the southeastern façade was also undertaken in general accordance with the above Standards, as it contains a roller door (currently used for deliveries) that is considered to be acoustically weak. As there are no layouts currently available, and thus the location of the class spaces are unknown, this test has been conducted as a worst-case scenario where typically loud classes are located adjacent to this wall.

The full results of the test are presented in Appendix D (Test B). The single figure result of the test is 28dB D_w .

The sound insulation tests were compromised by road traffic activity and other environmental noise outside of the unit. Despite this, however, the measured results are considered to be a reasonable representation of the true performance of the measured external walls. Subjectively, the sound insulation performance of the southeastern façade was considered to be reasonably poor due to flanking through gaps around the roller door.

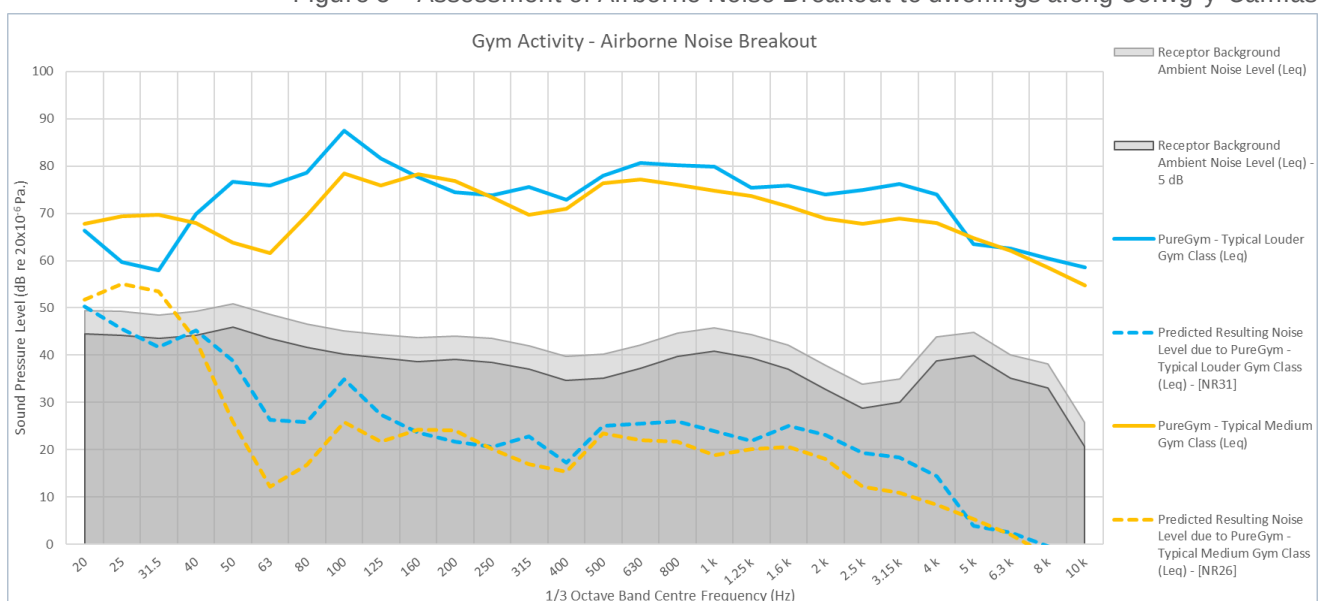
From the results of the sound insulation tests, an assessment of likely noise levels affecting the residential dwellings due to activity noise within the PureGym demise may be undertaken. This assessment has considered the typical activity noise levels within the PureGym unit, as presented in Table 2 of this report.

5.1 Activity Noise Breakout Assessment – Rear Facade

The latest formal class activities that take place within a typical PureGym are from 20:30 to 21:30 hours. These classes generate higher levels of airborne sound due to amplified music and raised voices from instructors compared with general use of the gym.

Considering the above, and based on the ambient sound levels measured during this later evening period, up to 22:00 hours, Figure 5 below presents the results of an assessment of activity noise breakout during this critical period for the rear external wall. This assessment has assumed distance attenuation from the unit to the façade of the nearest affected receptor based on standard line source attenuation theory (circa 32 metres).

Figure 5 – Assessment of Airborne Noise Breakout to dwellings along Golwg-y-Gamlas



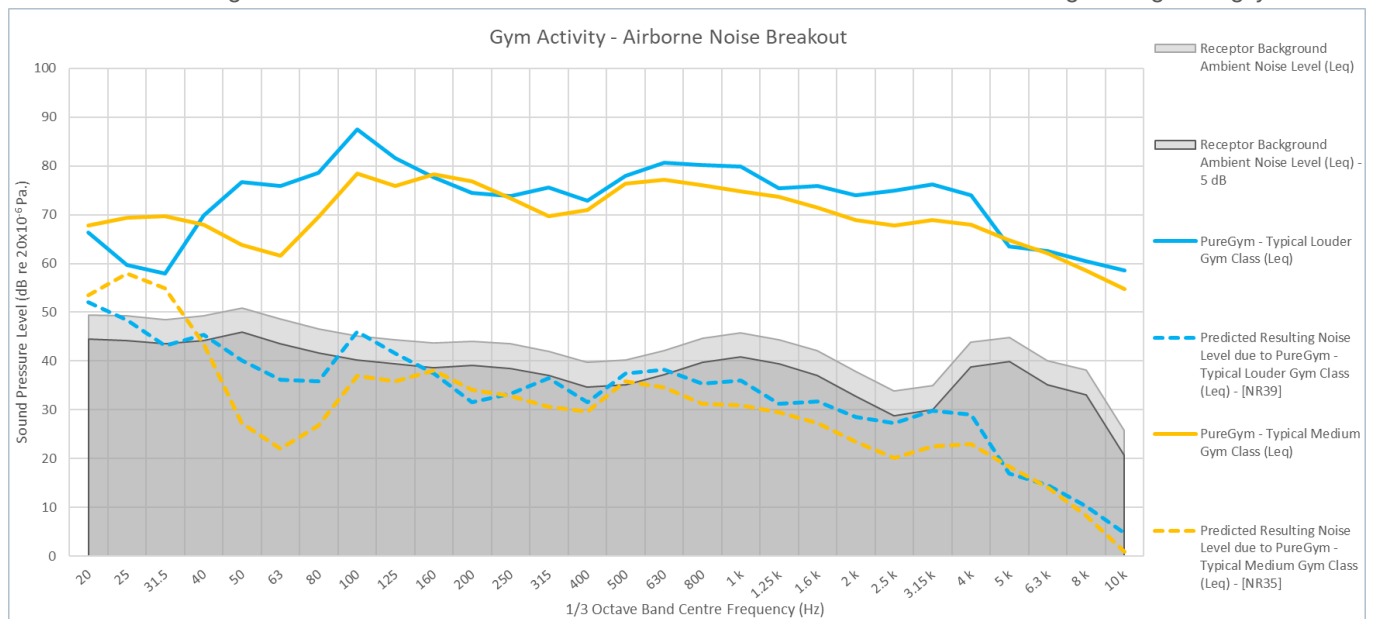
It can be seen from the above that activity noise is expected to be at least 5dB below the otherwise prevailing ambient sound level at the façade of the nearest affected noise sensitive properties at the majority of frequencies.

At the lowest frequencies, i.e. those below 40Hz, some exceedance of the otherwise background sound level (-5dB) are apparent, however, the reliability of the measurements at these low frequencies are considered to be limited due to long wavelengths and the diameter of the sound level meter diaphragm. As such, it is not considered that the predicted exceedances at these frequencies are significant.

5.1 Activity Noise Breakout Assessment – Side Façade (Roller Shutter Doors)

Considering the worst-case scenario presented above, and based on the ambient sound levels measured during this later evening period, up to 22:00 hours, Figure 6 below presents the results of an assessment of activity noise breakout during this critical period for the southeastern façade wall, including the roller shutter doors. This assessment has assumed distance attenuation from the unit to the façade of the nearest affected receptor based on standard line source attenuation theory (circa 32 metres).

Figure 6 – Assessment of worst-case Airborne Noise Breakout to dwellings along Golwg-y-Gamlas



It can be seen from the above that activity noise is expected to be mostly 5dB below the otherwise prevailing ambient sound level at the façade of the nearest affected noise sensitive properties at the majority of frequencies. There are some exceedances between 500Hz and 630Hz, at 100Hz, and below 40Hz.

At the lowest frequencies, i.e. those below 40Hz, some exceedance of the otherwise background sound level (-5dB) are apparent, however, the reliability of the measurements at these low frequencies are considered to be limited due to long wavelengths and the diameter of the sound level meter diaphragm. As such, it is not considered that the predicted exceedances at these frequencies are significant.

5.2 Recommended Mitigation

If the Studio/Spin Studio of the Gym is to be located near the southeastern façade wall, close to the roller shutters, it is recommended that mitigation measures are implemented to control airborne sound transmission to the nearest residential dwellings.

The exposed areas of the separating wall to the main Gym areas should be acoustically lined in accordance with the following specification:

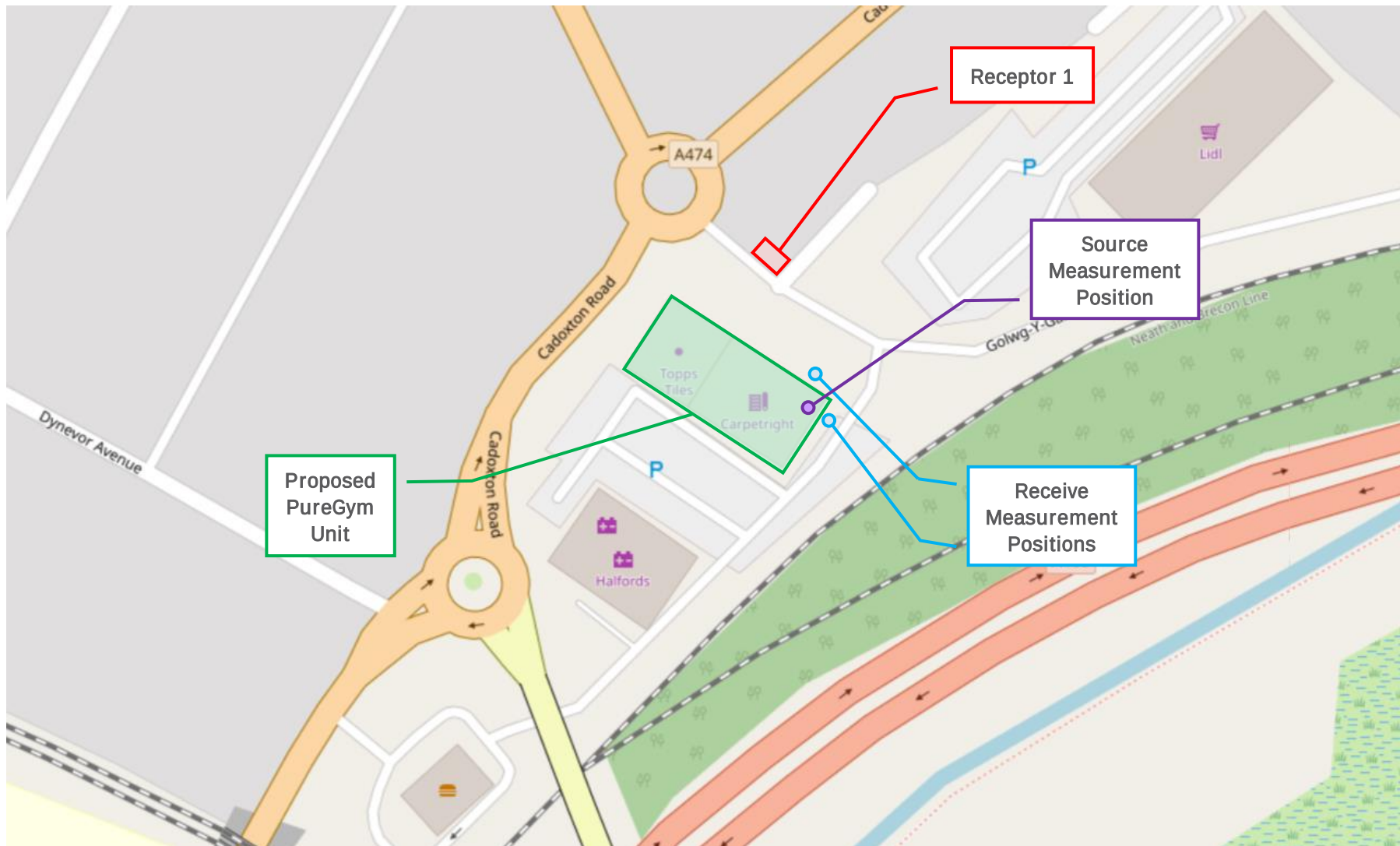
- Independent stud frame to suit partition height and stability, forming a minimum 100mm cavity between external wall/roller shutter doors and the inside board faces of the wall lining
- 2x layers 15mm Gyproc SoundBloc or Knauf SoundShield Boards with staggered joints
- Void to be filled with minimum 75mm high density Rockwool (Minimum 120kg/m³)
- Ties back to the party wall to be via acoustic braces (Gyroc GAB3 or similar)

APPENDICES

Appendix A Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g. L_{A10} , L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.
Noise Rating (NR)	A standardised set of curves relating octave-band sound pressure level to the centre frequency of the octave bands, each of which is characterised by a 'noise rating' (NR), which is numerically equal to the sound pressure level at the intersection with the ordinate at 1kHz.

Appendix B Site Plans



PureGym – Unit 2, Neath Retail Park, Neath
 Site Location Plan
 Project 13484

Figure A
 4 April 2024
 Not to Scale



Appendix C Details of Measurement Equipment

The following equipment was used for the measurements.

Table C2 – Equipment Calibration Details I

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Norsonic Type 1 Sound Level Meter	Nor140	1407961	477897612	5 May 2025
Norsonic Pre Amplifier	1209	23789		
Norsonic ½" Microphone	1225	496124		
Norsonic Sound Calibrator	1255	125526425	Cal 022-2023-17161	5 May 2025

Table C2 – Equipment Calibration Details II

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Norsonic Type 1 Sound Level Meter	Nor140	1403127	U43500	28 February 2025
Norsonic Pre Amplifier	1209A	12071		
Norsonic ½" Microphone	1225	41473	43499	28 February 2025
Norsonic Sound Calibrator	1251	31986	U43498	28 February 2025

Table C3 – Equipment Calibration Details III

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Valid Until
JBL Loudspeaker	515XT	VTP1124-18980	N/A	N/A
NTI Minirator	MR2	G2L-RAAAX-F2	N/A	N/A

Appendix D Test

Results of Airborne Sound Insulation

TEST A – External Wall Fronting Dwellings

Standardised Level Difference According to BS EN ISO 16283-1:2014 Field Measurements of Airborne Sound Insulation Between Rooms

Client : PureGym

Date of Test : 27 March 2024

Operative : Martin Raisborough
Test Methodology : BS EN ISO 16283-1:2014

Construction Details & Test Arrangement :
Blockwork to circa 2.5m, then lightweight cladding
above, including lightweight composite roof

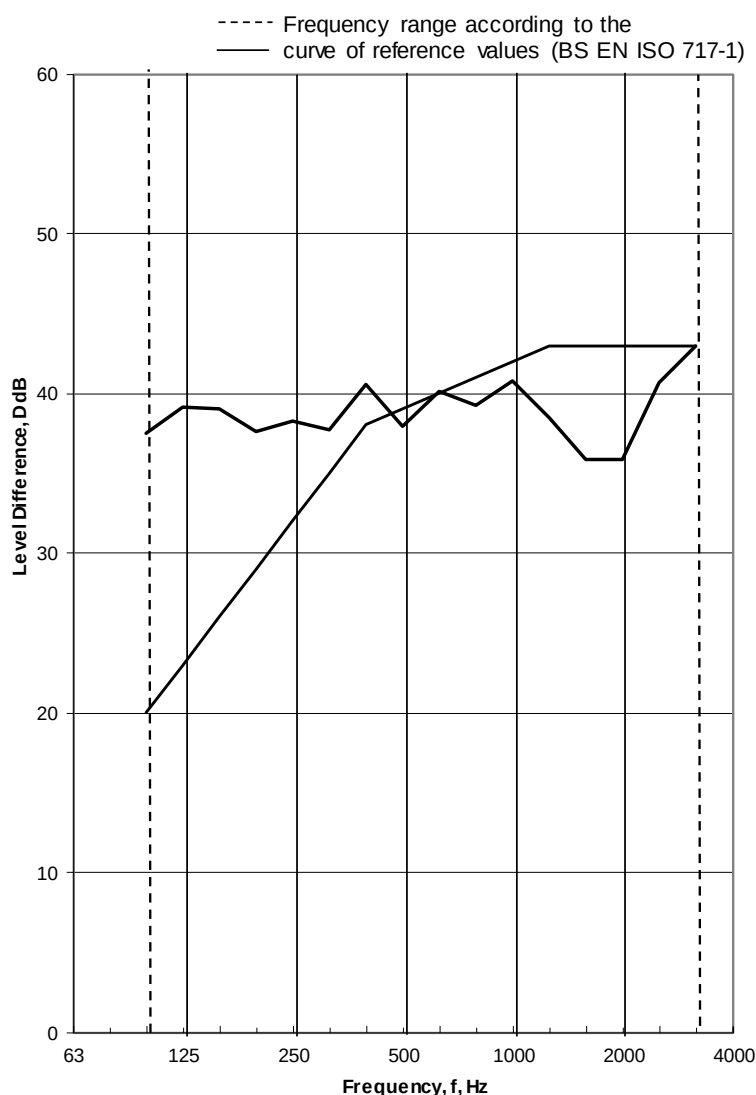
Test Type : Airborne Party Wall
Source Room : PureGym Unit
Receive Room : Breakout to Environment

Equipment Details :
See Appendix C

Source Room Volume: n/a m³
Receive Room Volume: n/a m³

Frequency, f (Hz)	D (1/3 octave) dB
50	
63	
80	
100	37.5
125	39.1
160	39.0
200	37.6
250	38.2
315	37.7
400	40.6
500	37.9
630	40.1
800	39.2
1000	40.8
1250	38.5
1600	35.8
2000	35.8
2500	40.7
3150	42.9
4000	
5000	

≥ indicates maximum background correction



Rating according to BS EN ISO 717-1 :

$D_w (C; C_{tr}) = 39 (-1; -1) \text{ dB}$

Evaluation based on field measurement results obtained in one-third octave bands by an engineering method.

No. of test report : Test A

Name of test company : RBA Acoustics

Date of Test Report : 04 April 2024

TEST B – External Wall Containing Roller Door

Standardised Level Difference According to BS EN ISO 16283-1:2014 Field Measurements of Airborne Sound Insulation Between Rooms

Client : PureGym

Date of Test : 27 March 2024

Operative : Martin Raisborough
Test Methodology : BS EN ISO 16283-1:2014

Construction Details & Test Arrangement :
Blockwork to circa 2.5m, then lightweight cladding above, including lightweight composite roof. Roller door inset.

Test Type : Airborne Party Wall
Source Room : PureGym Unit
Receive Room : Breakout to Environment

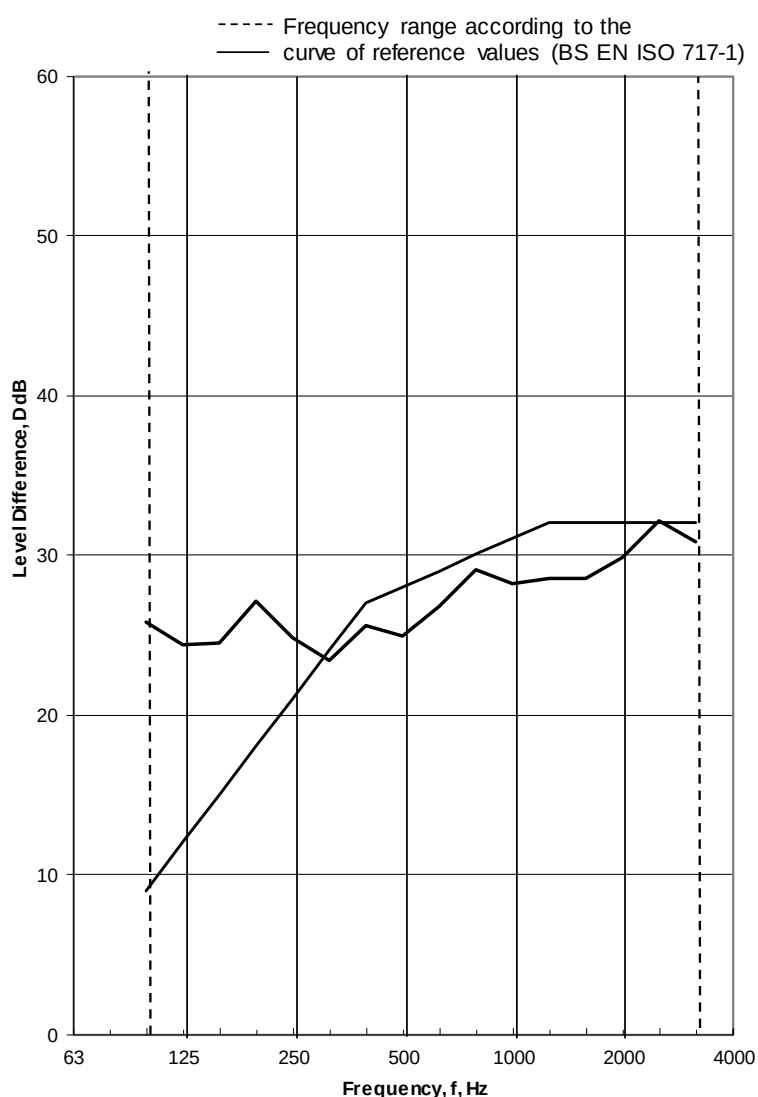
Equipment Details :
See Appendix C

Source Room Volume:

Receive Room Volume:

Frequency, f (Hz)	D (1/3 octave) dB
50	
63	
80	
100	25.8
125	24.4
160	24.5
200	27.1
250	24.8
315	23.4
400	25.6
500	24.9
630	26.8
800	29.1
1000	28.2
1250	28.5
1600	28.5
2000	29.8
2500	32.1
3150	30.8
4000	
5000	

≥ indicates maximum background correction



Rating according to BS EN ISO 717-1 :

$D_w (C; C_{tr}) = 28 (0; -1) \text{ dB}$

Evaluation based on field measurement results obtained in one-third octave bands by an engineering method.

No. of test report : Test B

Name of test company : RBA Acoustics

Date of Test Report : 04 April 2024

RBA ACOUSTICS

W. www.rba-acoustics.co.uk

E. info@rba-acoustics.co.uk

London:

44 Borough Road

London SE1 0AJ

T. +44 (0) 20 7620 1950

Manchester:

Lowry House, 17 Marble Street

Manchester M2 3AW

T. +44 (0) 16 1661 4504

