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Technical Report:

Site Survey,
Acoustic Design Advice
For 20 Blyth Road, Hayes UB3 1BY

dBC 10062

Acoustic Design Advice

Date of Issue:	27th November 2023
Compiled by:	Mr M Lane BSc(Hons), DipIOA, MIOA
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Rev 2	Mezzanine floor change and gym layout	8th March 2021
Rev 3	New Planning application submission	27th September 2023
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Rev 5	Report revision	27th November 2023

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1. Executive Summary

1.1. Four previous reports have been produced for Energie Hayes, 20 Blyth Road, Hayes, Middlesex, UB3 1BY.

Document Reference	Issued	Notes
dBC/Hayes/10062/ML/001	July 2019	Suitability study prior to the gym fit out and construction of a mezzanine floor
dBC/Hayes/10062/ML/002	March 2021	Added detail about the mezzanine floor and existing (current) gym layout
dBC/Hayes/10062/ML/03	September 2023	Assess existing noise levels in the gym by subjective and objective methods and provide any mitigation measures if required
dBC/Hayes/10062/ML/04	October 2023	Revises 03 report with updated Yard music volume.

Table 1: Previous Reports

1.2. This 05 report revises and rephrases the dBC/Hayes/10062/ML/04 report.

1.3. AJ Schroeter will submit a new planning application to vary the existing opening hours of 6am to 10pm Monday to Friday and 8am to 8pm Saturday and Sunday to allow 24hr use of the gym.

1.4. To accompany the planning application AJ Schroeter has commissioned dB Consultation Ltd (dBC) to undertake a building acoustics survey at Energie Hayes to determine existing gym noise levels and undertake subjective observations within a residential flat directly above the gym during normal operations.

1.5. All previous noise mitigation measures that were recommended within previous reports for this site have been implemented, installed and completed. Consequently, the gym has operated without noise complaints since opening.

1.6. To determine existing gym noise levels site surveys were undertaken on the 5th September 2023 and 18th October 2023.

1.7. Using the existing gym activity noise levels and the sound insulation of the separating floor between the gym and second floor residents dBC determined that all assessment criteria outlined in ProPG: Gym Acoustics Guidance (GAG 2023) would be met.

1.8. On the 5th September, during subjective observations inside Flat 11 on the second floor no general activity or weight drop noise was audible.

1.9. Considering the existing gym noise levels, Yard classes not operating at night, the sound insulation of the building and implementation of the previous recommendations any possible disturbance to local residents is likely to be reduced to a minimum. It is unlikely that gym noise would cause any sleep disturbance following implementation of 24hrs a day operation.

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2. Introduction

2.1. To accompany the planning application for change of operation hours AJ Schroeter has commissioned dB Consultation Ltd (dBC) to undertake a building acoustics survey at 20 Blyth Road, Hayes to determine existing gym noise levels and undertake subjective observations within a residential flat directly above the gym during normal gym activity.

2.2. Recent site surveys have been undertaken on the 5th September 2023 and 18th October 2023.

2.3. The previous reports, site surveys, assessment and new report were undertaken by Mick Lane BSc (Hons) Dip.IOA MIOA of dB Consultation Limited, a practicing acoustician for over 18 years, Full Member of the Institute of Acoustics (MIOA) and experienced in noise assessment in many industrial and commercial sectors.

2.4. This report has been reviewed by Danny Blacklock, Managing Director at dB Consultation Limited, a Full Member of the Institute of Acoustics (MIOA) and a Chartered Engineer, experienced in noise assessment in many industrial and commercial sectors.

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3. Site Layout

3.1. The ground floor plan of 20-30 Blyth Road, Hayes is shown in Fig. 1 below. The gym occupies the ground floor indicated in red and has a mezzanine floor as shown in Fig. 2.

3.2. The ground floor is adjacent to residential reception area, stairwell and refuse and cycle stores.

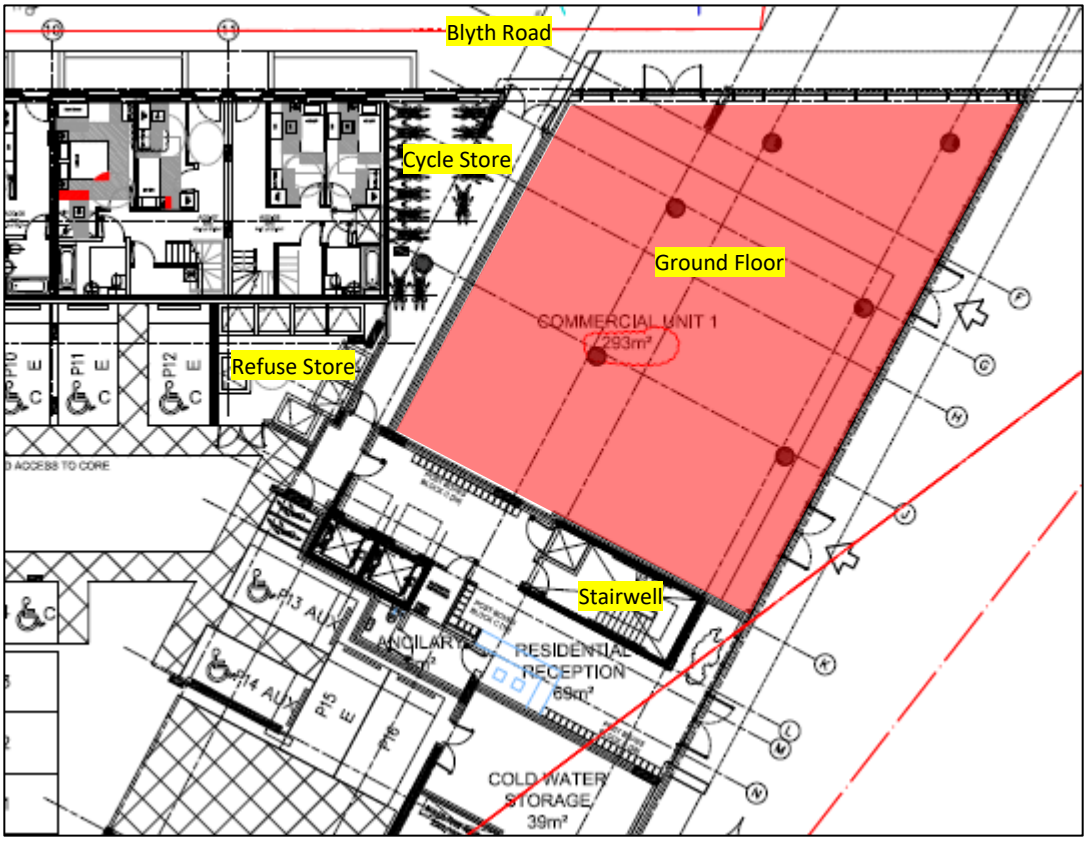

Fig. 1: 20-30 Blyth Road, Hayes ground floor Layout

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3.3. The mezzanine floor was constructed during the gym fit out and one side is adjacent to a first-floor residential unit. The separating wall between the mezzanine and first-floor unit is marked in blue.

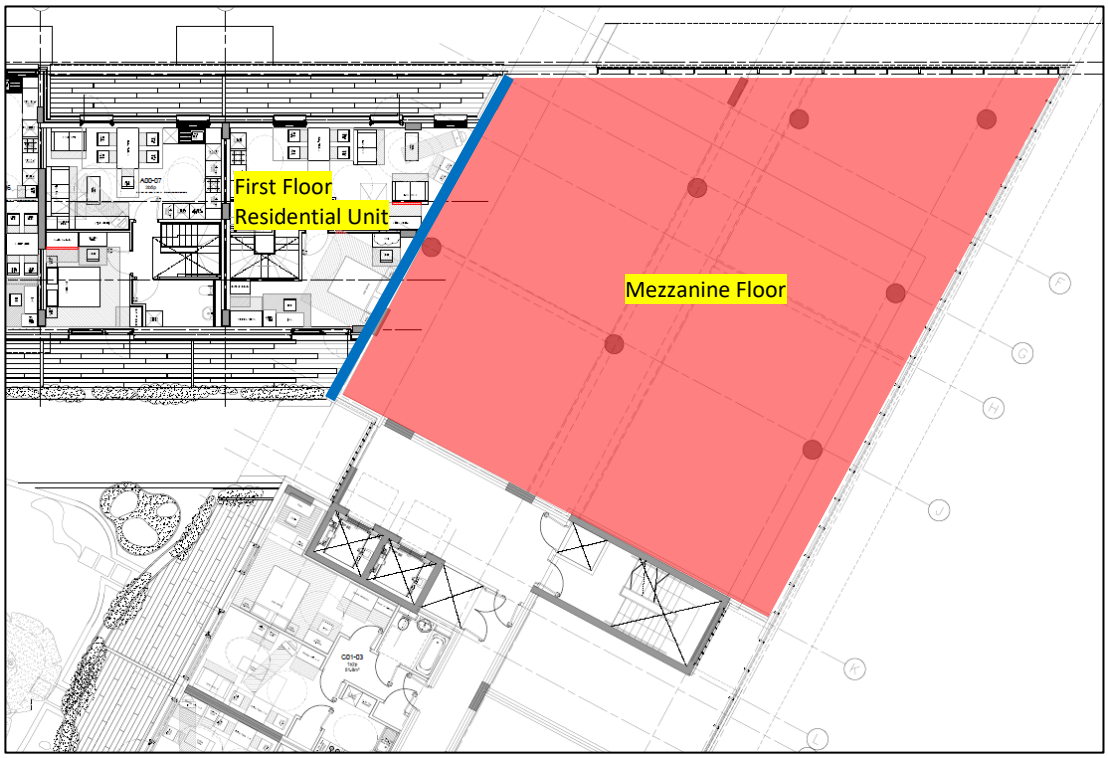

Fig. 2: 20-30 Blyth Road, Hayes mezzanine floor layout

Photo 1: CGI of the completed building

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3.4. The ground and first floor gym layouts are shown in Fig. 3 and Fig. 4 below.

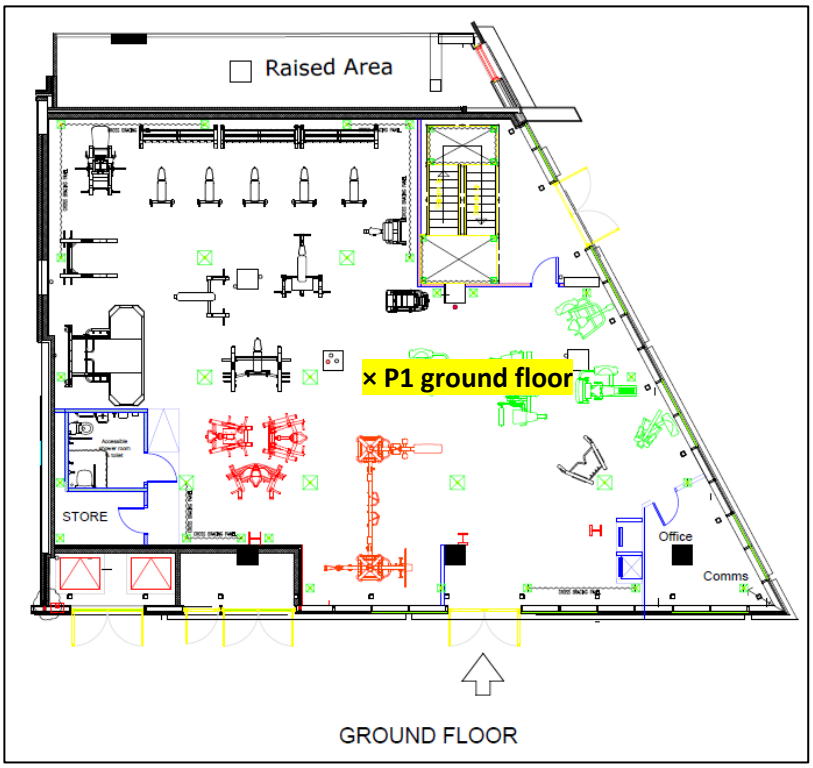

Fig. 3: Gym Ground Floor layout

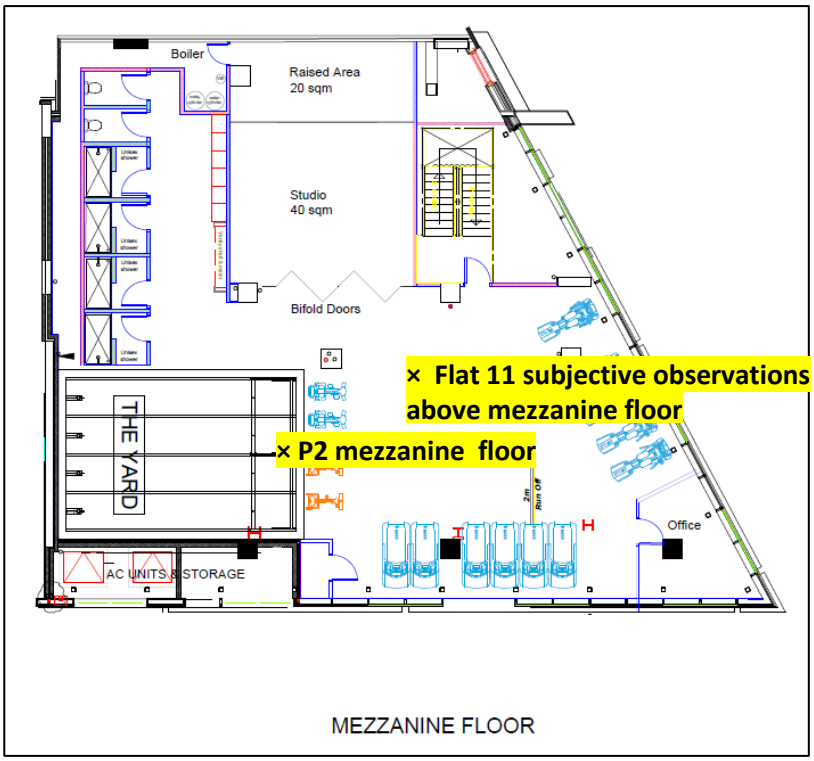

Fig. 4: Gym mezzanine floor layout

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3.5. Structural borne noise transfer between floors is of most concern for gyms e.g. noise from free weight areas, pin resistant machines and treadmills.

3.6. In terms of noise control, the gym layout has been optimised as originally advised. The weight drop zone is on the ground floor and the studio and Yard on the mezzanine floor separated from residents on the same floor by the changing area and stairwell. The mezzanine floor is separate in parts from the surrounding walls that is likely to reduce noise transfer.

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4. Planning Conditions/Criteria/Guidance

4.1. No internal noise level criteria have been set for this site. So, dBC will use guidance levels outlined in Table 4 in Section 7 of BS 8233:2014 as set out in the tables below.

Table 4 **Indoor ambient noise levels for dwellings**

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 1: Internal Ambient Noise Levels

4.2. Table 1 is usually applied to external noise sources such as road or rail traffic but can be used as guidance to noise levels that should not be exceeded in residential dwellings. The internal noise level within a bedroom should not exceed 30dB $L_{Aeq,8hr}$. This value is usually determined over an 8hr period but dBC believes it is prudent to reduce gym noise to below 30dB(A) for the entire period.

4.3. The matrix can be used to determine the minimum sound insulation requirement between the gym and bedroom. The privacy requirement of a bedroom is moderate and noise sensitivity is sensitive, the gym noise can be very high, so the minimum sound insulation requirement is 57dB $D_{nT,w}$ as indicated below.

Table 3 **Example on-site sound insulation matrix (dB $D_{nT,w}$)**

Privacy requirement	Activity noise of source room	Noise sensitivity of receiving rooms		
		Low sensitivity	Medium sensitivity	Sensitive
Confidential	Very high	47	52	57 A)
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Moderate	Very high	47	52	57 A)
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not private	Very high	47	52	57 A)
	High	37	42	47
	Typical	No rating	37	42
	Low	No rating	No rating	37

NOTE Background noise can also influence privacy. See also 7.7.6.3.
A) $D_{nT,w}$ 55 dB or greater is difficult to obtain on site and room adjacencies requiring these levels should be avoided wherever practical.

Table 2: On-Site Sound Insulation Matrix

4.4. NR (Noise Rating) curves can be used to assess commercial noise, no NR criterion (to be met) have been given if this case. For information, dBC has assessed the gym noise in terms of NR30 curve.

Hz	31.5	63	125	250	500	1k	2k	4k	8k
NR30	76	59	48	40	34	30	27	25	23

Table 3: NR30 curve

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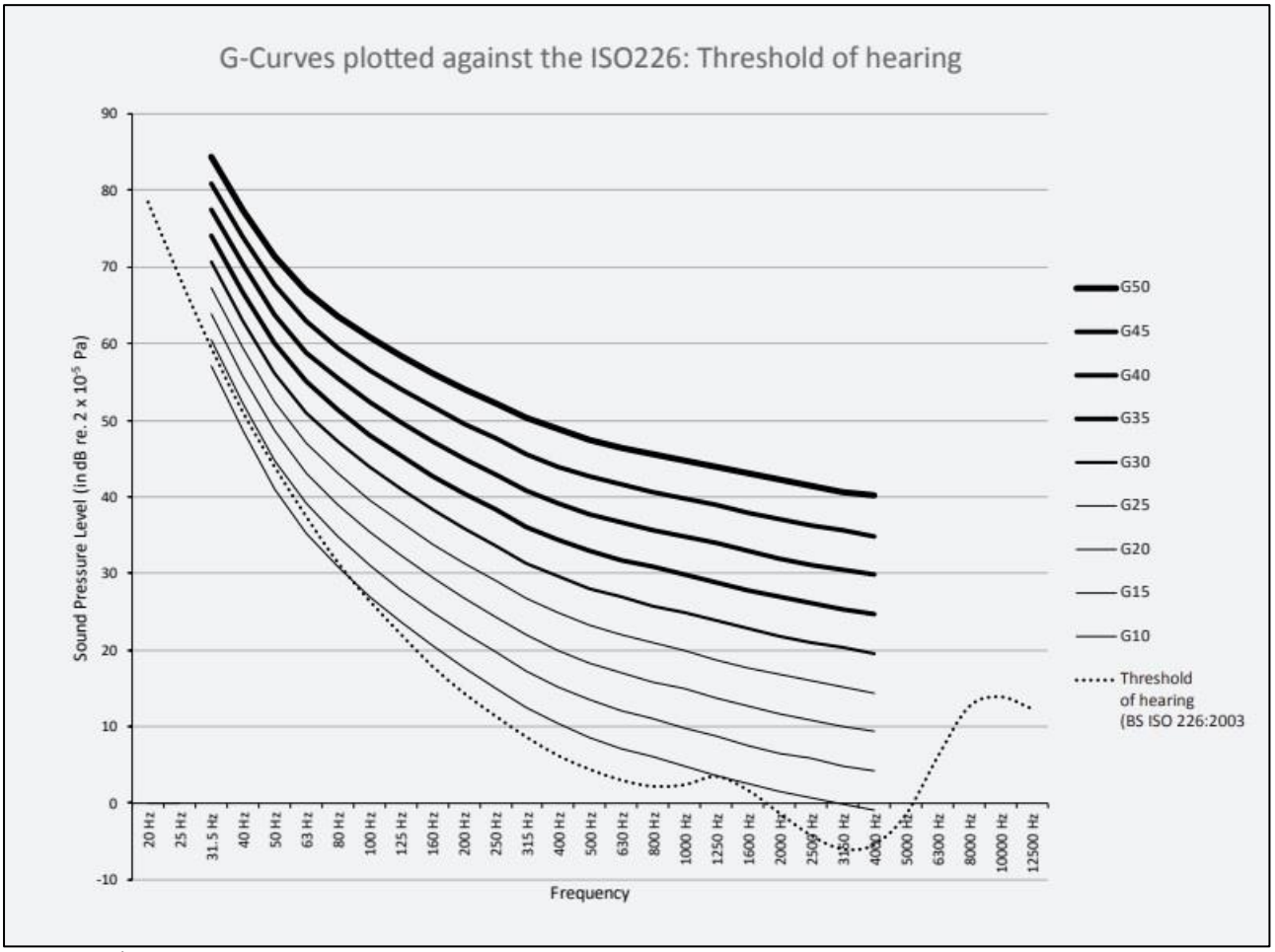
ProPG: Gym Acoustics Guidance (GAG 2023)

4.5. Issued in March 2023, the guidance is based upon the experience and current state of knowledge of the Working Group, at the time of writing.

4.6. Building Regulations requires specialist advice to be sought between commercial and residential spaces. Suitably Qualified Acousticians (SQA) can provide this advice and the application of this guidance may guidance may provide one way to demonstrate this.

4.7. Shown in the figure below is the G curves which form the basis for this assessment methodology.



Graph 1: GAG 2023 G curves

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4.8. Table 4 below is an excerpt from GAG2023 and shows the Guidance Internal Sound Target Criteria for Gym Activity – Residential & Other Areas.

Receptor type	**Guide Criteria** (for third octave band values plots against the stated G curve - see Figure 2)	
	Airborne Sound (e.g., music) $L_{eq,T}$ (31.5Hz to 8kHz)	Heavy Impact Sound $L_{max,F}$ (31.5Hz to 8kHz)
Commercial Offices	G25-G35	G35-G45
Retail Areas	G30-G45	G35-G50
Residential Areas	G15-G25 (day) G10-G20 (night)	G20-G25 (day) G15-G20 (night)

Table 4: Guidance Internal Sound Target Criteria for Gym Activity – Residential & Other Areas

DEFRA Guidance NANR45 Procedure for the assessment of low frequency noise (LFN) complaints

4.9. NANR45 provides a guide for Local Authorities on how to investigate low frequency noise complaints. The guidance uses (internal) measurements logged against a criterion curve, subjective observations and interviews to assist Environmental Health practitioners to handle complaints of low frequency noise as efficiently and correctly as possible. In particular, it aims to assist them to distinguish cases where an environmental sound that could account for the disturbance is present.

4.10. The NANR45 criterion curve is shown in Table 5 below.

Hz	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
L_{eq} dB	92	87	83	74	64	56	49	43	42	40	38	36	34

Table 5: NANR45 Criterion Curve (LFN)

Note: the criterion curve is linear dB values.

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Airborne and structural noise

a. Sound generated within the gym will be a combination sources, activity, conversation and music. The sound has the potential to transmit to adjacent spaces as airborne, structure-borne and impact sound as illustrated in Fig. 5 below.

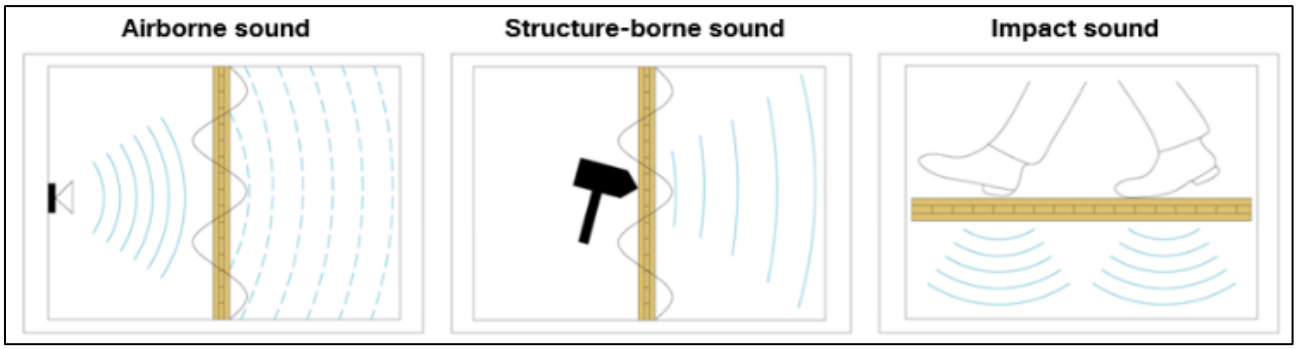

Fig. 5: Sound transmission paths.

b. One of the most important areas for noise control within a gym is the structure borne sound transfer from floors through concrete columns as illustrated in Fig. 6. This sound transfer can happen in reverse from the first floor down to the ground floor. in this instance it's ground floor up to first floor.

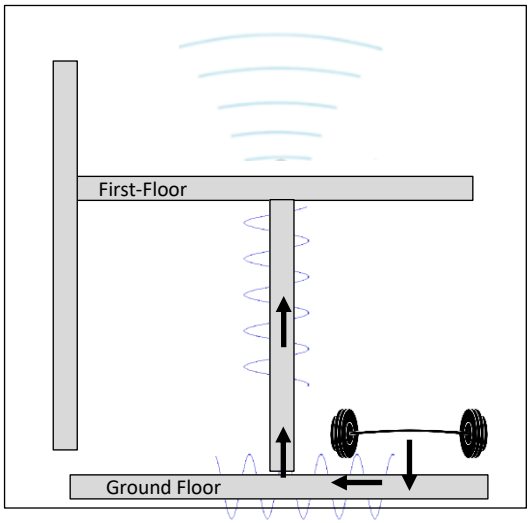

Fig. 6: Structure-borne sound transmission through a column

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5. Gym Sound

General Activity Noise

5.1. dBC undertook existing gym noise measurements on the 5th September 2023. The measurements were taken at location P1 and P2 as shown on Fig. 3 and Fig. 4 page 7.

5.2. Sound pressure levels were measured at P1 and P2 between 09:30 and 11:30. The parameters measured were $L_{Aeq,5min}$, L_{Amax} and the $L_{eq,5min}$ and L_{max} for frequencies between 31.5 and 4kHz.

5.3. The activity summary on the ground floor is shown in Table 6 below.

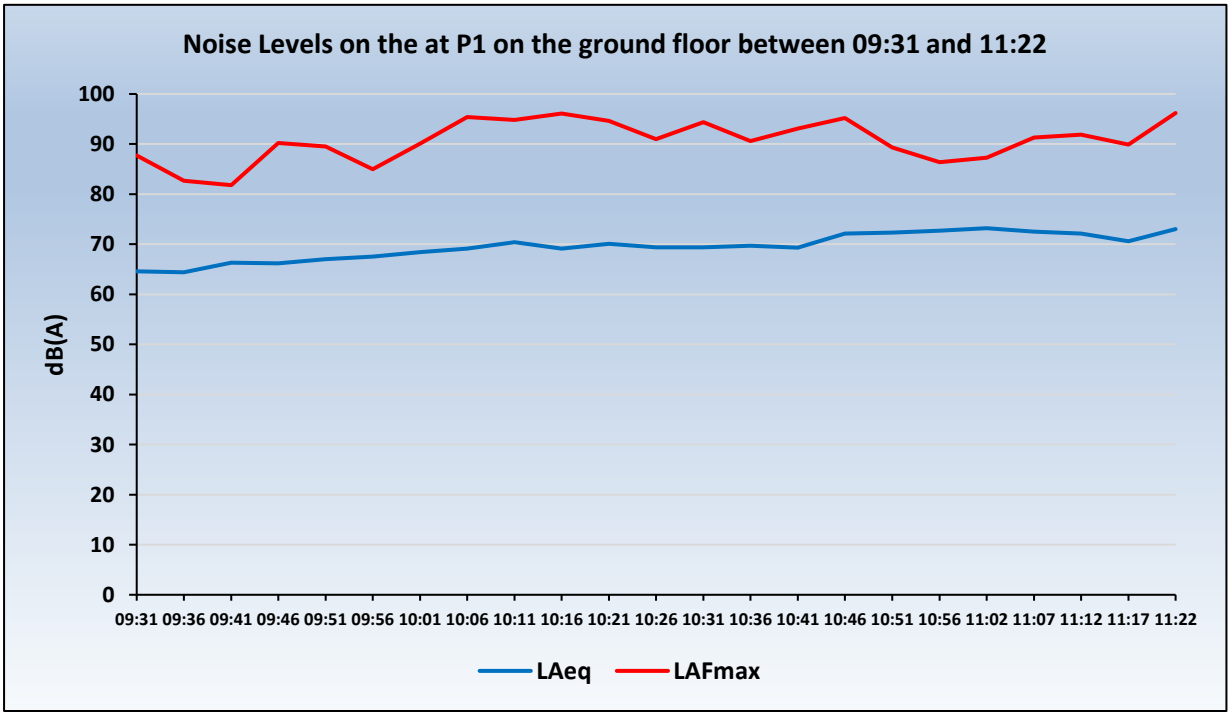
Floor	Activity
Ground Floor	Weight Drop Zone, free weights, lifting platforms, pin-resistant machines, . reception and office. 4 corner speakers with volumes equally set. All equipment and machines operating normally. 6 to 15 people using ground floor throughout period.
First Floor	Treadmills, static bikes, Yard, studio and changing rooms. Up to 6 people using first floor

Table 6: Energie Hayes Activity Summary

5.4. The Yard hosts between 3 and 6 classes every weekday between 07:00 (start) and 19:45 (finish). **Note there are no night-time classes.**

5.5. During the 5th September 2023 site visit, no Yard class was scheduled.

5.6. The overall and maximum noise levels at P1 are shown in Graph 2 below.



Graph 2: P1 Ground Floor noise levels in dB

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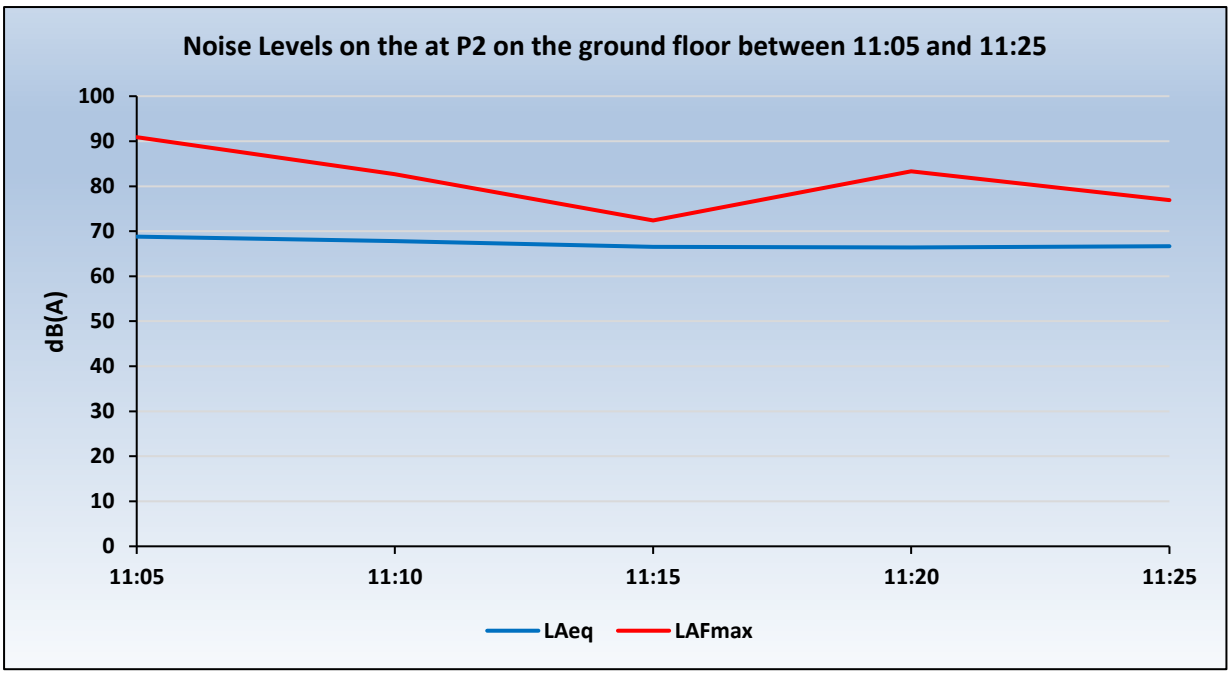
5.7. The noise levels at P1 increased from the start of the monitoring due to the number of people using the gym steadily increasing during the day. The gym was considered 'busy' at the end of the monitoring period.

5.8. The overall and maximum noise levels at P2 are shown in Graph 3 below.



Graph 3: P2 Mezzanine Floor noise levels in dB

5.9. At P2, the activity and music noise was very consistent.

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Subjective Observations 1 (flat)

5.10. On the 5th September 2023, Subjective observations were made and recorded in Flat 11, second floor above the mezzanine floor. In the flat the windows were open for ventilation, residents did not hear the gym and had not heard the gym. Throughout the flat the floors were hard and reflective.

Time	Observations
10:15 to 11:00	No gym noise. No music or activity noise form either the ground or mezzanine floors. Traffic noise buses, trains and cars dominate acoustic environment. Hayes & Harlington Station announcements noticeable inside flat. 10:30 Passing car playing music. 10:40 Children's voices (School Playground)

Table 7: Subjection Observations in Flat 11

Yard Music Volume

5.11. On the 18th October 2023, dBC re-visited the gym to assess typical music volumes in the Yard.

5.12. The applicant AJ Schroeter, demonstrated the operation of the music system and volume controls in the Yard. dBC measured the music volume, $L_{Aeq,30s}$, L_{Amax} and the $L_{eq,5min}$ and L_{max} for frequencies between 31.5 and 4kHz in the centre of the Yard between 13:50 and 14:10 for different but typical Yard music tracks. Table 8 shows the measurements.

	LAeq	LAmax	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k
Run 1	73	78	47	55	66	65	63	70	68	69	67	65	62	61	65	62	65	64	61	62	61	63	58	54
Run 2	73	78	49	56	64	62	66	74	71	67	65	65	60	64	67	67	68	65	61	59	57	57	53	50
Run 3	76	82	49	55	63	61	65	73	70	66	65	66	62	67	70	69	71	67	66	61	56	58	53	48
Run 4	81	86	51	56	64	63	73	78	73	74	73	69	64	69	74	72	72	68	70	73	71	68	64	60
Run 5	82	82	49	53	59	51	57	70	86	75	66	66	64	70	74	70	70	71	69	76	70	67	64	61
Run 6	81	85	50	55	66	63	67	73	69	74	71	69	65	71	76	74	71	69	67	70	70	70	63	62
Run 7	74	78	51	54	66	63	57	66	63	63	68	67	64	62	67	72	65	65	61	62	60	61	53	51
Run 8	71	76	48	53	64	65	67	74	73	70	70	63	60	60	58	59	60	62	60	59	60	61	58	56
Run 9	72	75	50	53	64	64	69	78	74	74	74	67	61	62	63	59	64	60	59	59	61	61	58	55
Run 10	75	80	61	62	67	62	64	72	69	69	66	65	62	63	69	69	65	65	65	62	61	63	59	55
Run 11	75	79	63	64	69	64	67	74	71	71	68	65	62	62	70	68	63	64	63	62	63	64	60	56
Run 12	77	82	50	58	65	63	69	76	73	74	71	67	59	62	67	67	64	66	64	64	68	69	67	60
Run 13	78	82	52	61	65	64	71	76	73	76	71	67	64	65	68	71	66	66	65	66	70	70	67	61
Run 14	77	83	47	53	67	60	65	75	69	72	71	67	61	62	66	70	69	69	66	65	68	65	62	57
Run 15	76	82	46	53	67	60	65	74	68	72	71	68	61	63	67	68	69	66	63	65	68	65	62	56
Run 16	76	80	49	52	62	58	69	70	70	71	71	68	65	63	67	70	68	68	64	65	64	66	62	57
Log Average	77	81	54	57	65	63	67	74	75	72	70	67	63	66	70	69	68	67	65	68	66	66	62	58

Table 8: Typical Yard music noise levels in dB

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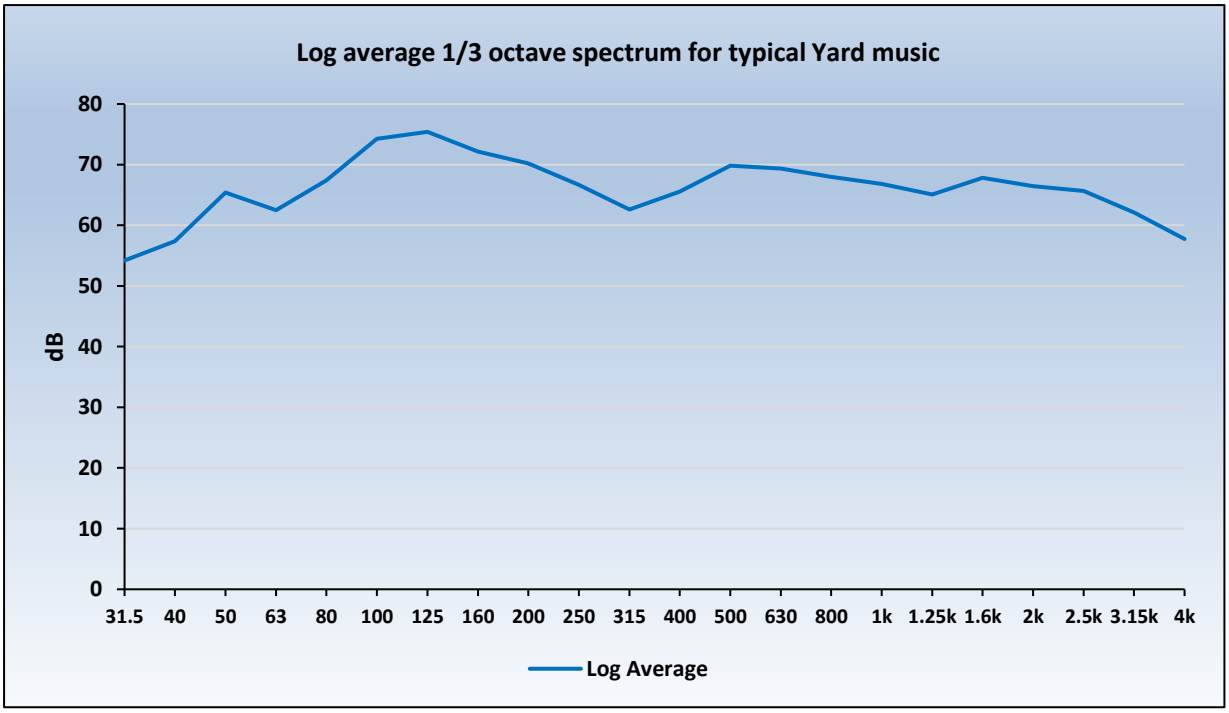
5.13. Graph 4 shows the log average 1/3 octave spectrum between 31.5Hz and 4kHz of the typical Yard music.



Graph 4: Yard Music average 1/3 octave spectrum in dB

5.14. The Yard music will be played through the existing sound system. The system has been set to provide adequate music volume for client satisfaction during a class, the system does not have a bass control or bass boost function. The volume is limited to that of a typical mobile phone.

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Subjective Observations 2 (gym)

6.1. In previous report dBC/Hayes/10062/ML/002, Section 11 set out the mitigation measures in terms of structural enhancements, mattings and managerial procedures required to reduce to a minimum the possibility of disturbing residents above the gym.

6.2. As far as dBC understands these measures have been implemented in full. dBC could not check structural changes because an intrusive investigation was not considered necessary. The gym does have effective matting and impact noise control throughout the weight drop zone as shown below.

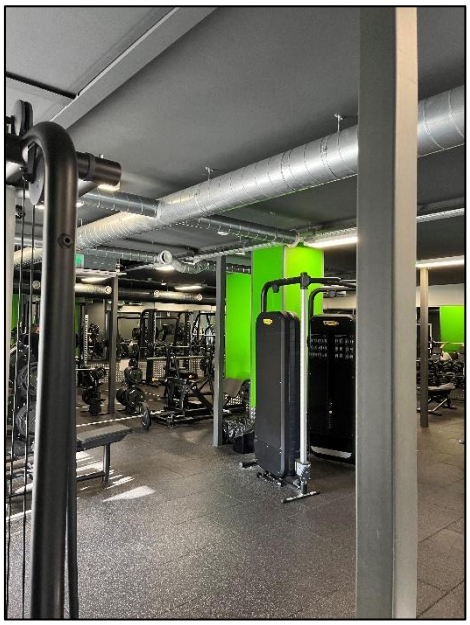

Photo 2: Weight drop zone

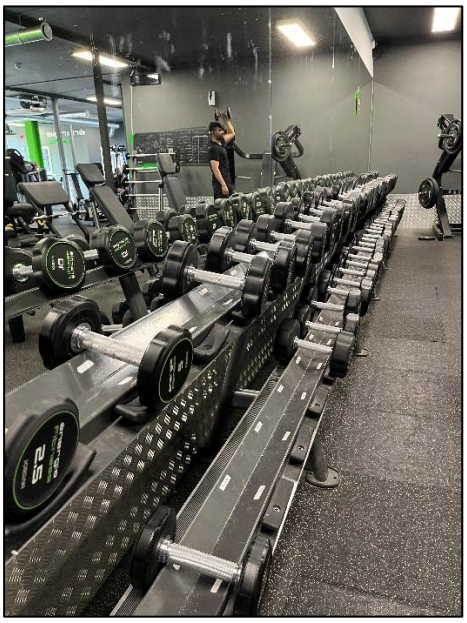

Photo 3: Rubber mounts below dumbbells

Photo 4: Rubber stops on weight stacks

Photo 5: Lifting platform

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Assessment levels

6.3. In previous report dBC/Hayes/10062/ML/002, the assessment levels were measured in a typical Energie gym site to be used with the existing structural elements to determine whether the space was suitable for use as a gym.

6.4. For this revised assessment dBC has measured the actual gym and yard noise at Hayes.

6.5. Table 9 shows the overall dB(A) and 1/3 octave band dB noise levels for the airborne (L_{eq}) and maximum (L_{max}) noise levels measured at Hayes.

Overall L_{eq}	dBA	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k
Airborne Yard	77	54	57	65	63	67	74	75	72	70	67	63	66	70	69	68	67	65	68	66	66	62	58
Airborne General Activity GF	72	69	64	64	72	73	62	64	65	64	63	62	65	65	65	63	61	61	60	61	59	61	56
Airborne General Activity FF	67	68	63	59	59	60	62	61	69	65	62	61	59	56	55	55	55	57	58	56	54	52	51

Maximum L_{Max}	dBA	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k
General Activity Maximum GF	95	77	71	65	71	67	63	76	74	76	73	76	73	74	79	81	77	74	79	87	80	91	82
Airborne Yard Maximum	81	62	64	73	70	75	82	79	78	76	74	71	72	77	77	76	75	73	75	75	74	70	65

Table 9: Gym activity noise in dB

6.6. Subjectively in Flat 11 there was no (heavy) impact noise attributed to the ground floor drop zone area e.g. free weights and pin resistant machines so an impact noise assessment was not undertaken.

6.7. Overall airborne L_{eq} noise levels were assessed against the G curve, LFN curve and NR curve criteria whereas airborne L_{max} noise levels were assessed against NR curve criteria.

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7. Separating Floor/Ceiling

7.1. The separating floor is shown in Fig. 7 below, showing additional plasterboard ceiling above the mezzanine (not to scale).

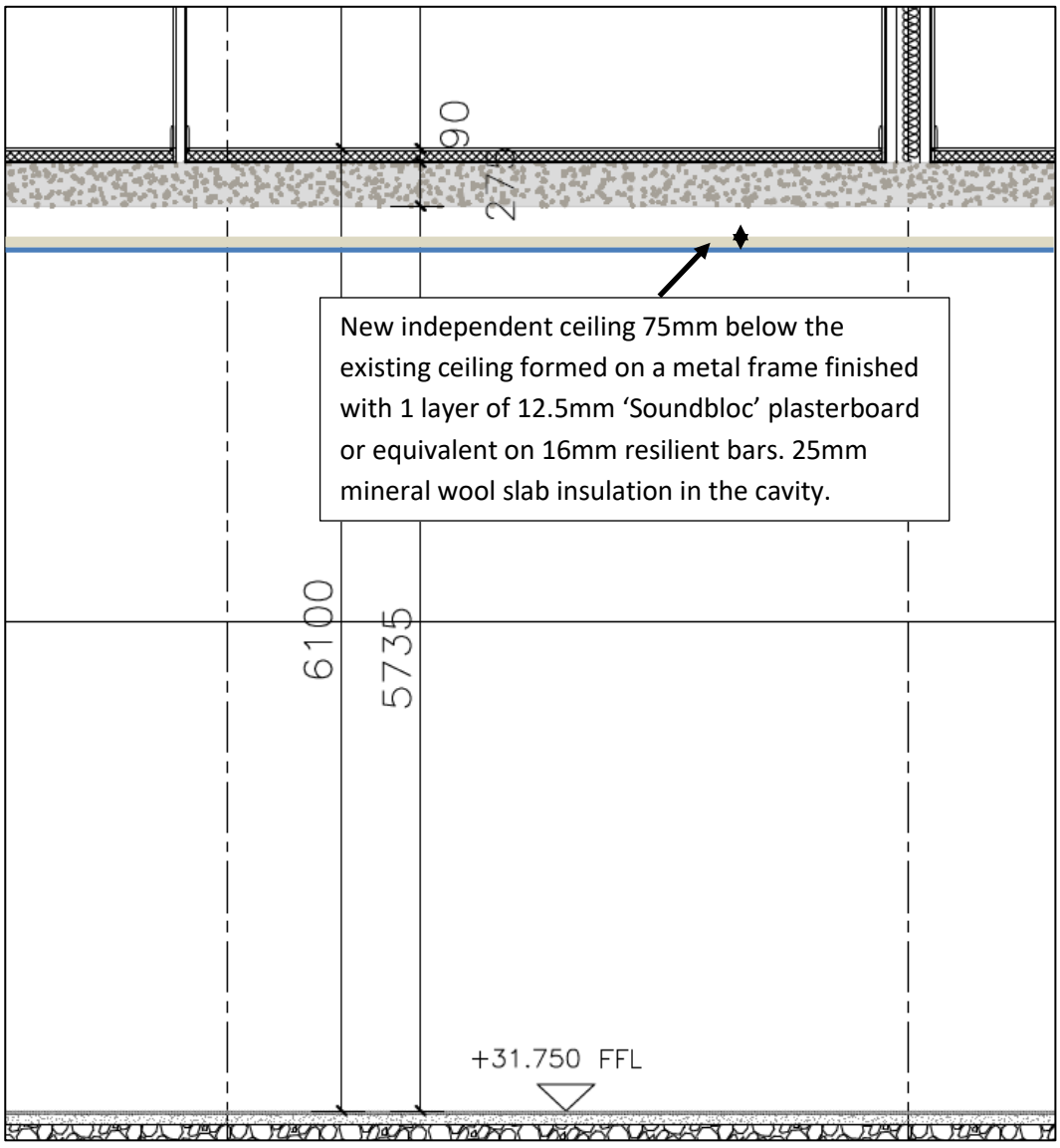

Fig. 7: Separating Floor Detail

7.2. The separating floor was a 275mm concrete slab overlaid by a 90mm timber platform floor, to ensure the NR30 noise levels are met on the second floor of the building the sound insulation of the separating floor/ceiling should be increased. A new independent ceiling was installed 75mm below the existing concrete. The ceiling was a MF ceiling finished with 1 layer of 12.5 'Soundbloc' plasterboard (or equivalent) on 16mm resilient bars. 25mm mineral wool slab insulation should be place in the cavity. The external walls and columns have been isolated from the plasterboard layer and there should be no penetrations through this ceiling and all gaps and joints should be effectively filled.

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7.3. The weighted sound reduction index, R_w and 1/3 octave band sound reduction indices, *R* of the upgraded floor were determined theoretically by INSUL Sound Insulation Prediction software. The values below have been used in the floor assessment of noise affecting the second floor.

Floor	Rw	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k
270mm concrete slab, timber platform floor and new suspended ceiling	74	33	38	43	39	43	49	53	57	61	64	66	69	72	74	77	79	81	83	83	83	83	83

Table 10: Sound Reduction Indices, *R* in dB

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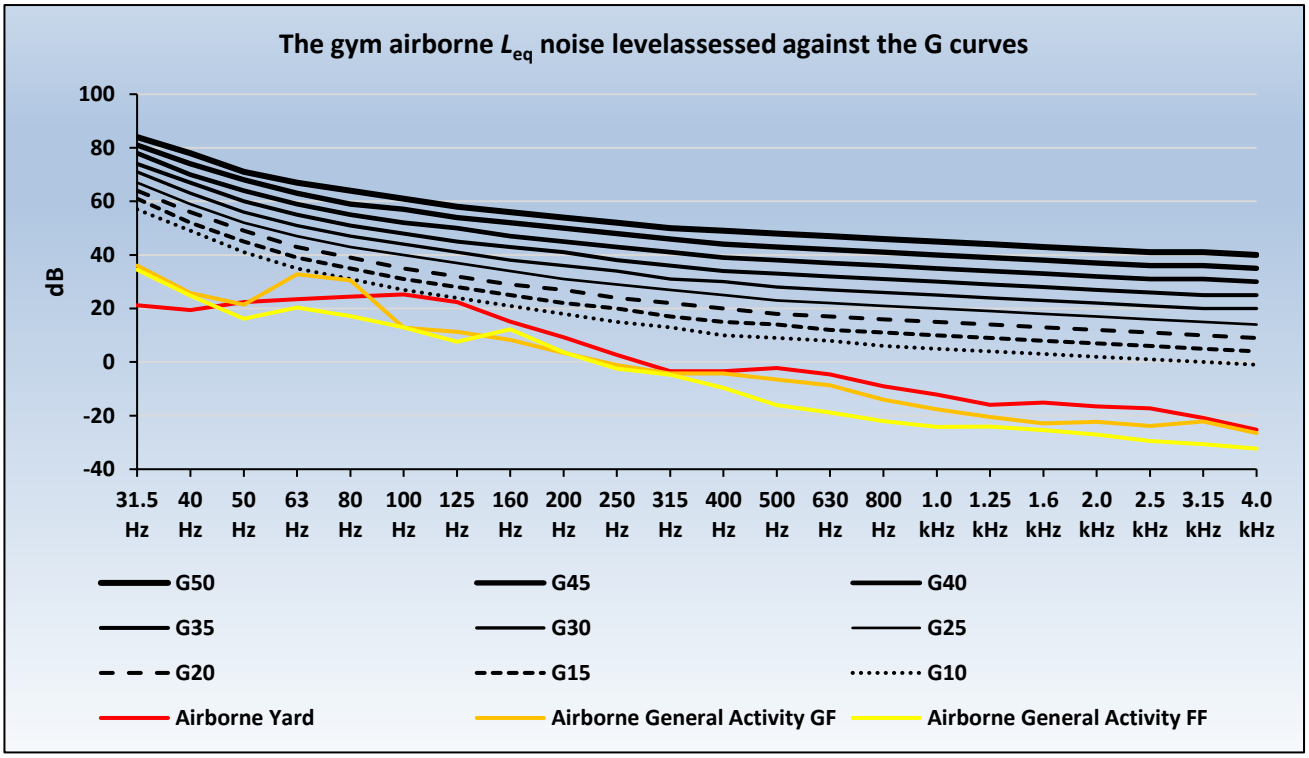
Floor Assessment

7.4. The predicted noise levels on the second floor have been determined as a level difference using the data in Table 9 and the 1/3 octave sound reduction indices, *R* for the separating floor shown in Table 10.

7.5. Graph 5 shows predicted airborne L_{eq} noise levels plotted against the GAG 2023 G curves as shown in Section 4. **Airborne L_{max} maximum noise levels are not assessed this way**.



Graph 5: GAG 2023 G Curve Assessment

7.6. The GAG 2023 G Curve assessment shows that the gym airborne L_{eq} noise levels were all G10 and below the Guidance Internal Sound Target Criteria (**day and night-time**) for Gym Activity – Residential & Other Areas shown in Table 4.

7.7. During the subjective observations, shown in Table 7 page 15, there was no general activity gym noise witnessed in Flat 11. The airborne Yard noise levels as shown in Table 8 page 15 are unlikely to be audible within Flat 11.

7.8. Yard classes do not run at night.

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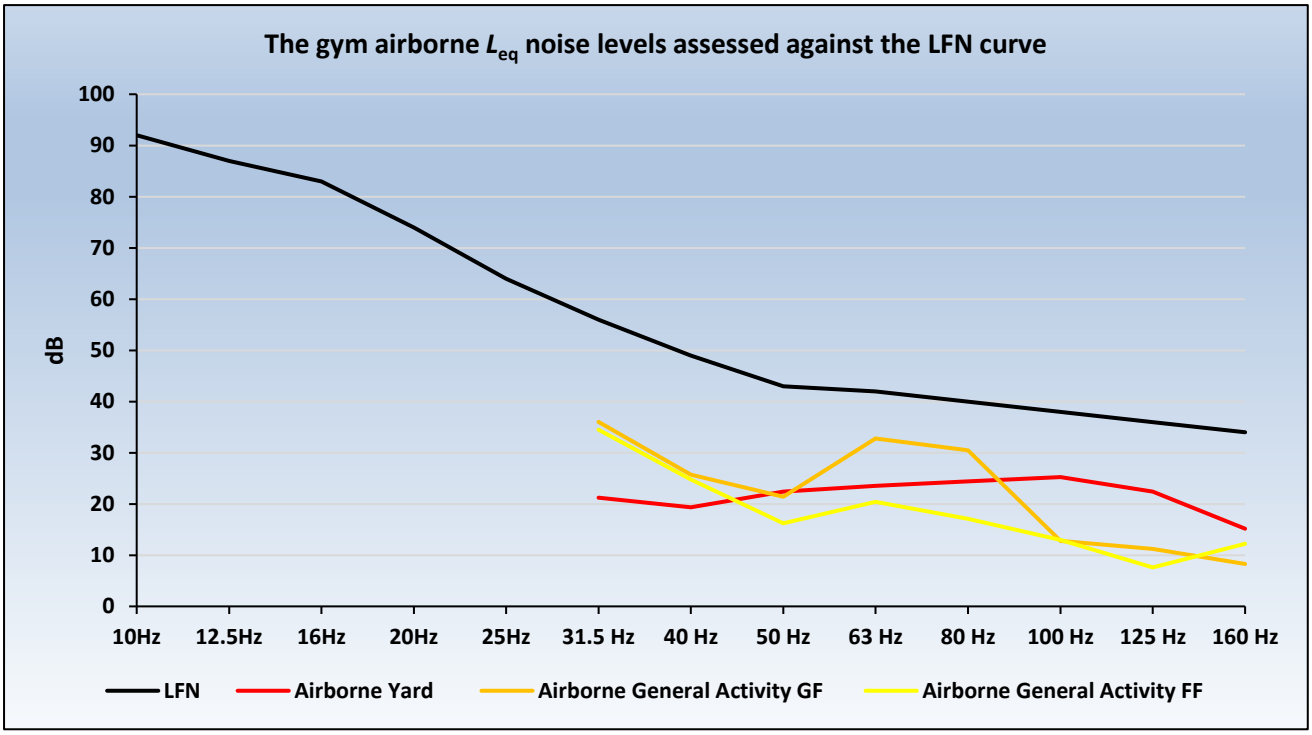
7.9. Graph 6 shows the airborne L_{eq} noise levels plotted against the NANR45 Procedure for the assessment of low frequency noise (LFN) curve.



Graph 6: LFN Assessment

7.10. The airborne L_{eq} noise levels were all below the the LFN curve.

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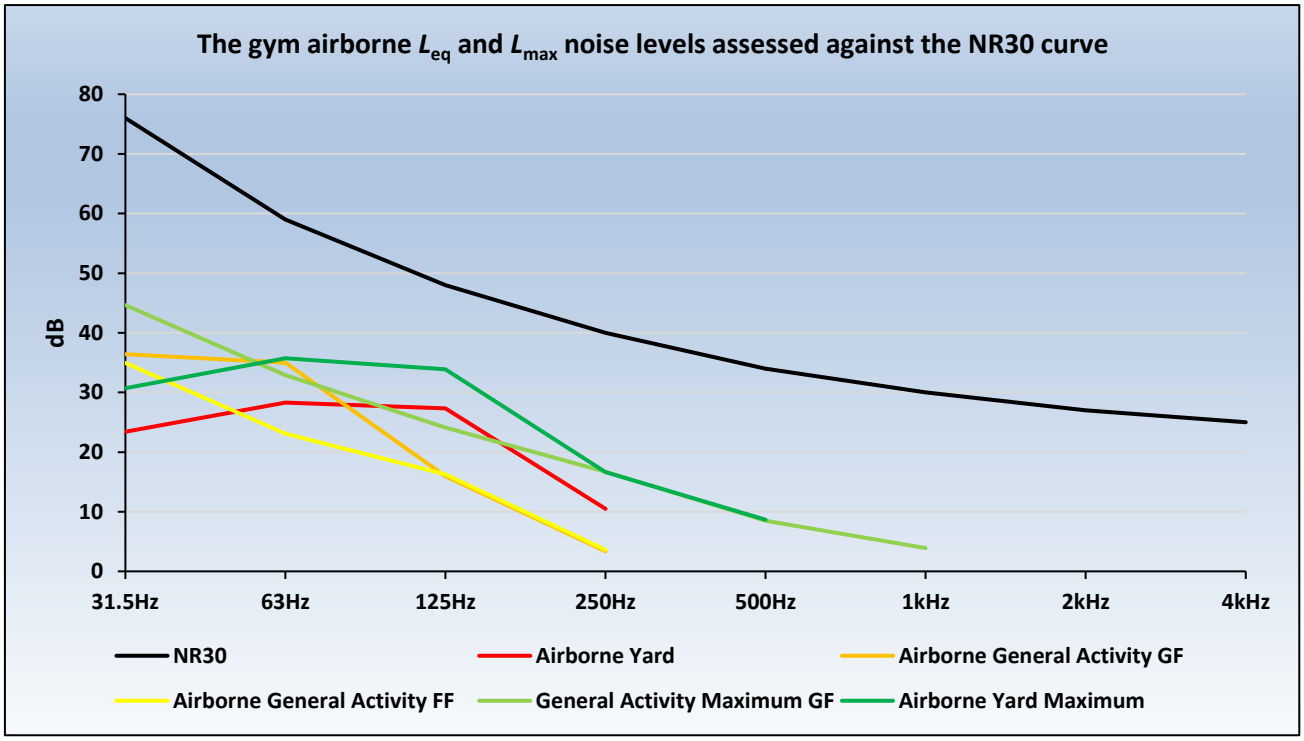
7.11. Graph 7 shows the airborne L_{eq} and maximum L_{max} noise levels plotted against the NR30 Curve.



Graph 7: NR30 Curve Assessment

7.12. All frequencies in all assessed parameters were below the NR30 curve. This was evident during the subjective observations in Flat 11.

7.13. The floor is substantial with good inherent sound insulation which ensures that airborne internal noise levels will be below the BS 8233 criteria of 35dB(A) during the day (07:00 – 23:00) and 30dB(A) at night-time (23:00 – 07:00) periods.

7.14. No further upgrades to the ceiling are required.

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Floor Assessment Summary

7.15. Table 11 summarises the assessment of floor's sound insulation against all the different gym noise and all the relevant standards and guidance.

Gym Noise	Standard/Guidance GAG 2023 G Curves		
	Assessment Level	Criteria	Comment
Airborne Yard	Graph 5 G10	G15 – G25 day G10 – G20 night	Compliant
Airborne General Activity GF	Graph 5 G10	G20 – G25 day G15 – G 20 night	Compliant
Airborne General Activity FF	Graph 5 G10	G15 – G25 day G10 – G20 night	Compliant

Gym Noise	Standard/Guidance NANR45 Procedure for the assessment of low frequency noise (LFN)		
	Assessment Level	Criteria	Comment
Airborne Yard	Graph 6	LFN Curve	Compliant
Airborne General Activity GF			Compliant
Airborne General Activity FF			Compliant

Gym Noise	Standard/Guidance Noise Rating		
	Assessment Level	Criteria	Comment
Airborne Yard	Graph 7	NR30	Compliant
Airborne General Activity GF			Compliant
Airborne General Activity FF			Compliant
General Activity Maximum GF			Compliant
Airborne Yard Maximum			Compliant

Gym Noise	Standard/Guidance BS 8233		
	Assessment Level dB(A)	Criteria	Comment
Airborne Yard	3	35dB(A) daytime 30dB(A) night-time	Compliant
Airborne General Activity GF	0		Compliant
Airborne General Activity FF	0		Compliant

Table 11: Floor Assessment Summary

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8. Columns

8.1. There are two types of supporting column in the commercial space, concrete and steel. The concrete columns support the main floor slab and the steel columns support the external balconies.

Photo 6: Concrete column

Photo 7: Steel column

8.2. Treadmills, cross trainers, resistant machines and loose weights use all have the potential to transfer impacts as structural noise via structural columns and walls.

8.3. The columns and external walls have been isolated from final screed layer with a resilient layer and appropriate flanking strips.

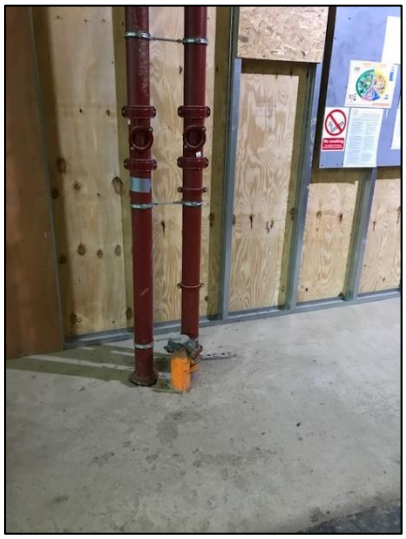

Photo 8: Wastewater pipes

8.4. The columns or wastewater pipes Have been encased for acoustic transfer and aesthetic reasons.

8.5. Equipment and music speakers should be attached to the columns and external walls with appropriate resilient fixings.

8.6. Section 5 shows photos of the internal layout and resilient mounts and fixtures used throughout the gym.

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9. Walls

9.1. The internal separating wall between the commercial unit and the cycle store was 2 leafs of 100mm dense concrete block separated by a 100mm cavity. The separating wall between the mezzanine floor and the first-floor residential unit was a twin stud wall, 450mm wide finished on either side with two layers of plasterboard, with insulation in the cavity.

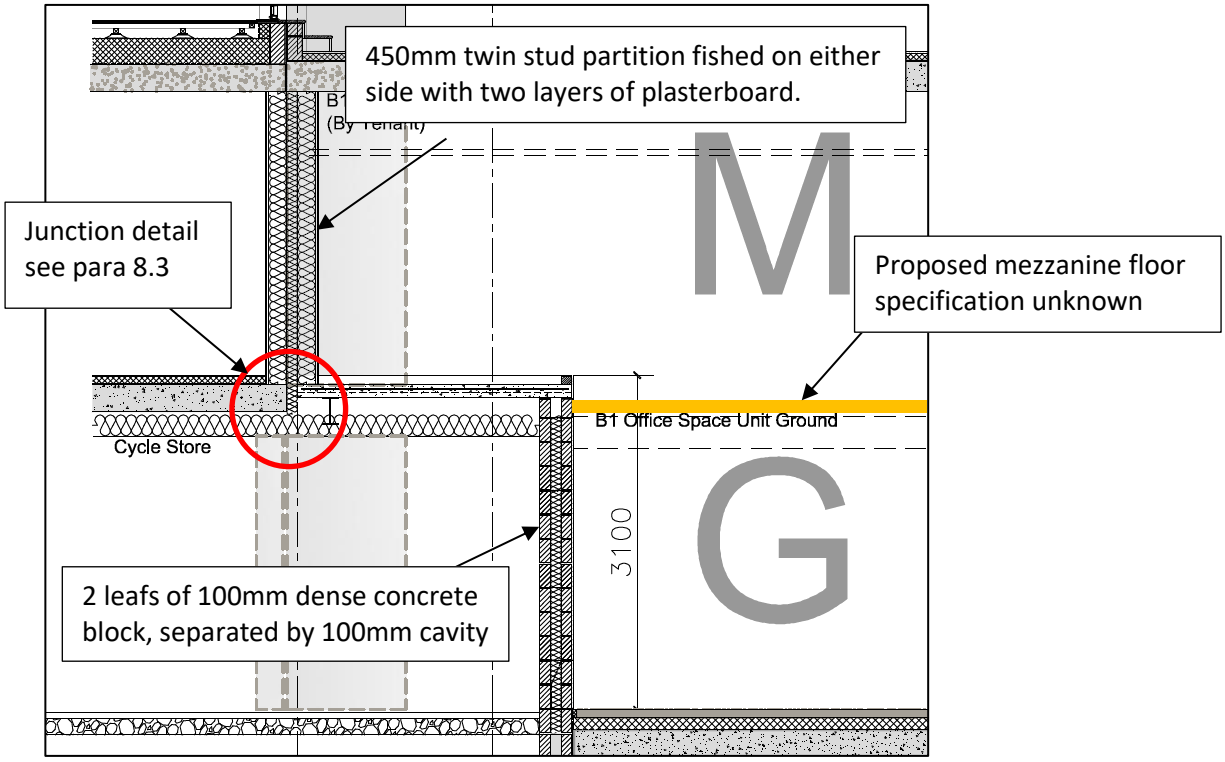

Fig. 8: Internal separating walls

9.2. The weighted sound reduction index, R_w and 1/1 octave band sound reduction indices, R were determined theoretically for both wall types by INSUL Sound Insulation Prediction software.

Separating Element	R_w in dB	Sound Reduction Indices, R in dB						
		63	125	250	500	1k	2k	4k
2 leafs of 100mm dense concrete block 100mm cavity	56	41	47	46	49	59	69	79
450mm wide, twin stud wall finished with two layers of plasterboard on either side.	64	27	43	53	64	73	78	64

Table 12: Sound Reduction Indices, R in dB

9.3. Original report dBC/Hayes/10062/ML/001 identified the junction detail (red circle) in Fig. 8 may have been acoustically weak had it been adjacent to the higher noise generating activities within the gym. **Following the gym fit out this wall is adjacent to a services void and changing rooms, therefore is less susceptible to gym noise following fit out and no enhancement was required.**

9.4. Both walls have good inherent sound insulation properties. Given the adjacent use of the ground floor is a cycle store (low sensitivity) and the first floor residential, separated by changing room and service void no further further assessment of sound insulation is required at this time.

9.5. The external walls are a combination of glazing and high curtain walling. The curtain walling forms the lower part of the balcony walls as shown in photos 9 & 10.

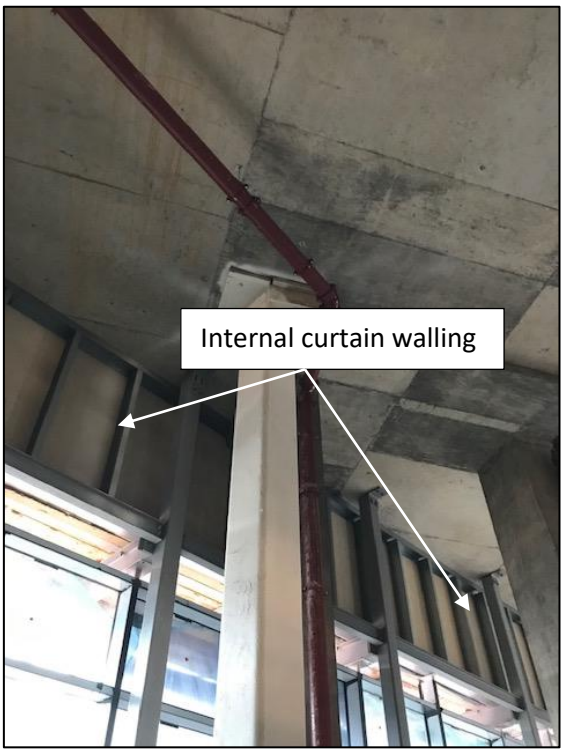

Photo 9: Internal curtain walling

Photo 10: External balcony walling

9.6. In the original report, dBC/Hayes/10062/ML/001 dBC recommended internal layers above the windows were enhanced with additional mass layers. **This has been implemented in full**.

9.7. The windows are well sealed and adequate for use in a gym. The gym noise breakout affecting first-floor residents is less likely through the windows than the curtain walling discussed above because there is an amount of covered walkway above the windows which will provide significant screening. No changes to the windows are required.

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10. General Advice and Reverberation Time

10.1. During the original survey, due to the progression of the construction there were noticeable gaps under the windows due to no finished floor in the unit and no external paving area. See Photos below there are no remaining gaps.

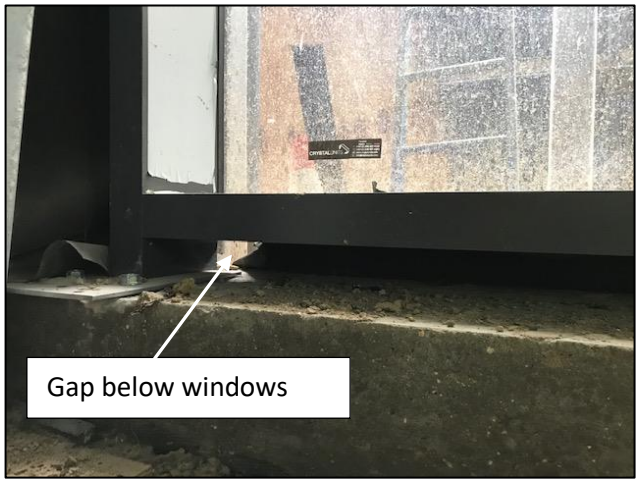

Photo 11: Lower part of external wall

Photo 12: wall fully sealed with the ground

10.2. The boxing bag supporting structure in the Yard must be secured to the subfloor. The bags have a spring attachment as opposed to solid clip attachment seen in other Energie gyms. The spring should reduce noise transfer to the supporting structure.

Photo 13: Boxing bags at Energie Southend

Photo 14: Boxing bags at Energie Hayes

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Reverberation Time

10.3. Since the fit out of the gym, machines, equipment, fixtures and fittings and soft furnishings have been installed on both the ground and mezzanine floors. These all serve to absorb and breakup the existing sound fields in the gym. Consequently, excessive reverberation is not an issue at Hayes and no further reduction in reverberation time is required.

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11. Conclusions/Recommendations

11.1. The floor assessment summary shown in Table 11 Page 24 shows that the airborne overall and maximum noise levels meet all the assessment criteria.

11.2. Gym noise has not been a subject of a compliant during the time of operation.

11.3. During the site visit on the 5th September 2023, during subjective observations in Flat 11 on the second floor above the gym, no general activity gym noise was witnessed.

11.4. No impact noise from the ground floor drop weight area was witnessed inside Flat 11.

11.5. All mitigation measures recommended in the original reports dBC/Hayes/10062/ML/001 and 002 have been implemented in full.

11.6. No further mitigation measures are required for gym noise at Hayes.

11.7. Energie Hayes has produced a **Yard Noise Management Plan** that is incorporated into management policy and procedures.

The **Noise Noise Management Plan** is as follows:

- The Noise Management Plan for the Yard is for the control of music volume during Yard activity classes.
- Music can only be played through the existing music system in the Yard.
- No additional mobile speakers can be used.
- The access to the music system cabinet is controlled by the Gym Manager and Gym Owner.
- Volume control must remain unchanged.
- Playing of tracks will be through the instructor's mobile phone via Bluetooth connectivity only.
- Volume will be restricted to that of a normal mobile phone.

11.8. During some Yard activity medicine balls are dropped. Although no noise complaint has been received regarding Yard activity, as part of the continual improvement within the gym, dBC would recommend that additional matting tiles are used during these activities to reduce maximum noise levels caused by the use of medicine balls.

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12. 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 can be used to duplicate the ear's variable sensitivity to sound across a spectrum of frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the average 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).

$L_{eq,T}$

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 Leq. The Leq is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period (T).

$L_{10,T}$

This is the minimum level exceeded for not more than 10% of the time period (T). This parameter is often used as a "not to exceed" criterion for noise.

$L_{90,T}$

This is the minimum level exceeded for not more than 90% of the time period (T). This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{fmax}

This is the maximum sound pressure level that has been measured over a period using a fast time constant.

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 combine, on a logarithmic scale, 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 3 identical sources produce a 5dB 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.