

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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Gym impact noise transfer assessment

Summary

Sandy Brown have been appointed by Beech Holdings to carry out post completion acoustic testing to discharge Planning Condition 14 based on an updated weight limit and flooring product installed at basement level.

Impact noise transfer from gym free-weight drops to Level 1 residential apartment 110 were carried out. The results indicate that with the installed resilient floor, impact noise level transfer in the residential apartment above exceeds internal noise limits with gym free-weights ≥ 25 kg.

It has been confirmed that free-weights are limited to 25 kg, with the current gym free-weights in use and the current flooring installed, Planning condition 14 can be discharged.

A gym site inspection was carried out at ground level, there are installed treadmills and other gym machines types with weights up to 104 kg that have the potential to result on impact noise transfers to residential apartment 110. These machines are installed in a solid floor and not mounted on resilient pads, introducing the risk of impact noise transfer to residential apartment 110 from free-weight drops and the use of other gym machines.

There are loudspeakers installed in the gym, however it has been confirmed that they are not in use, and not proposed to be in operation due to licensing restriction and costs associated.

Introduction

Sandy Brown have been appointed by Beech Holdings to carry out post completion acoustic testing to discharge Planning Condition 14 based on an updated weight limit and flooring product installed at basement level.

The purpose of the acoustic testing is to establish the exiting sound levels in residential apartment 110 from gym free-weight drops area at basement level.

A site inspection of other gym equipment was carried out.

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This memo presents the survey method, measurement results and comments on the measured noise levels in apartment 110 from different gym free-weight drops.

Acoustic criteria

Planning condition 14

Planning condition 14 of Manchester City Council decision notice 123371/JO/2019 the following:

Notwithstanding the noise assessment stamped as received by the City Council, as Local Planning Authority, on the 7 November 2017 and update stamped as received by the City Council, as Local Planning Authority, on the 5 January 2018,

- (a) Prior to the first use of the commercial units and gym area as indicated on drawing 103_101 Rev P6 stamped as received by the City Council, as Local Planning Authority, on the 31 January 2018, a scheme of acoustic insulation shall be submitted for approval in writing by the City Council, as Local Planning Authority.*
- (b) The approved scheme shall then be implemented and a post completion survey submitted for approval in writing by the City Council, as Local Planning Authority, prior to the first use of each of the commercial units and the gym area. The measures implemented shall be retained and maintained for as long as the development remains in use.*

Reason: In order to limit the outbreak of noise from the commercial premises pursuant to policies SP1 and DM1 of the Core Strategy (2007) and saved policy DC26 of the Unitary Development Plan for the City of Manchester (1995).

Development criteria

There are no British Standards or guidance documents that set criteria for structure-borne noise from the impacts of free-weights and weights machines.

It is recommended that structure-borne noise transfer due to the dropping of gym weights on Level 1 of the gym is limited to L_{AFmax} 35 dB in Level 2 residential apartments. This limit is 10 dB below the WHO guidelines which indicate that L_{AFmax} 45 dB is the onset of sleep disturbance. The limit is above the internal noise criterion of (L_{Aeq} 30 dB in bedrooms and L_{Aeq} 35 dB in living areas).

Impact noise transfer measurements

Survey method

Impact noise transfer testing was carried out between the Basement level gym free-weight drops area and residential apartment 110, bedrooms and living area, this apartment is considered noise sensitive at all times of the day. The gym free-weight area in which the free

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weights were dropped are marked-up with an 'X' in Figure 2, and receiver rooms marked-up as 1 to 3 in Figure 3.

Measurements were carried out on 13 February 2024 by Jose M. Gonzalez and the assistance of James Pinner and Carlos Rodriguez (Residence Manager at Ancoats Gardens).

All weights were dropped from knee height (approximately 0.5 m) on to the installed STOCKZ CLASSIC 10 mm rubber flooring (980 kg/m³). The testing free-weight dropping location is highlighted in green in Figure 1.

The test conditions were considered to present a typical scenario of a gym user, therefore the measurements that form the basis of this assessment are considered suitable for a normal use for this space.

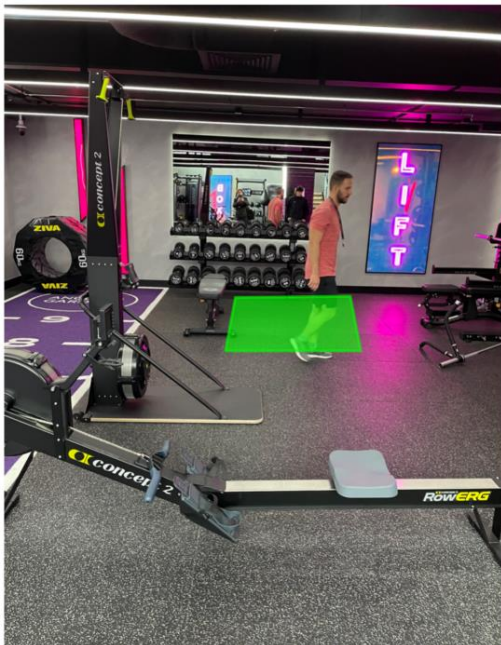


Figure 1 Photograph showing the testing free-weight dropping location

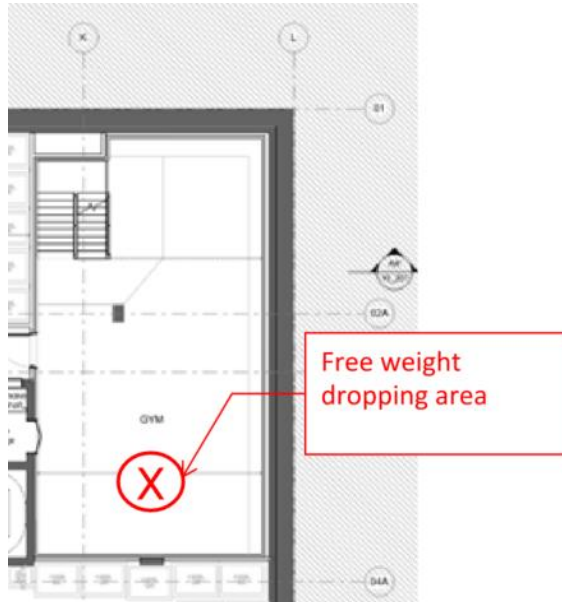


Figure 2 Gym Layout at basement level

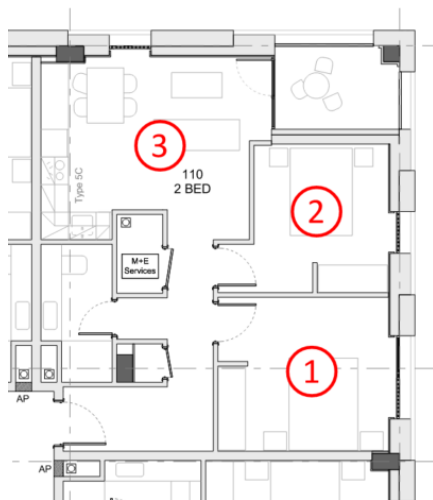


Figure 3 Residential apartment 110 receiving spaces above the gym

Measurement results

Impact sound measurement result

Each gym free-weight drop event was measured over a short period to measure the maximum noise level generated. Measurements were carried out such that impact sound levels were the dominating source, and when necessary up to four repetitions were measured to obtain a representative measurement.

In this case, the worst-case measurement result for each case is presented in Table 1.

Extraneous noise sources were also present at the time of testing due to external traffic. Every effort was made to repeat measurements where these affected the results. Any clearly extraneous measurements have been omitted from the assessment. However, given the proximity of the noise criteria to the measured background maximum noise level, there is a risk that elements of the background noise climate may have also affected the measured maxima in some instances, therefore measurement results have been background corrected where necessary and presented in Table 1.

For measurement results in residential apartment Living room, the predicted maximum noise levels are presented in brackets, this is the log subtraction of the measured background noise levels and the measured maximum noise levels from weight droppings, and considered the resultant noise levels in the apartment living room from free- weight droppings within Basement level.

No tactile vibration was perceptible during any of the measurements.

Table 1 Summary of measurement results

Room	Gym free-weight	Measured maximum sound pressure level, L_{AFmax} (dB)
1 – 110 Bedroom	37.5 kg	43
	35 kg	40
	32.5 Kg	36
	30 kg	34
	25 kg	35
	20 kg	34
	15 kg	33
2 – 110 Bedroom	37.5 kg	37
	35 kg	37
	32.5 Kg	36
	30 kg	35
	25 kg	35
	20 kg	32
	15 kg	33
3 – 110 Livingroom	37.5 kg	42
	35 kg	40 (corrected for background 39 dB)
	32.5 Kg	41 (corrected for background 40 dB)

Room	Gym free-weight	Measured maximum sound pressure level, L_{AFmax} (dB)
3 – 110 Livingroom	30 kg	41 (corrected for background 38 dB)
	25 kg	39 (corrected for background 37 dB)
	20 kg	37 (corrected for background 35 dB)
	15 kg	39 (corrected for background 37 dB)

The measured background noise levels were:

- 1 – Bedroom: L_{Aeq} 33 dB (NR26)
- 2 – Bedroom: L_{Aeq} 33 dB (NR28)
- 3 – Livingroom: L_{Aeq} 37 dB (NR33)

The measured reverberation times with the apartment fully furnished were:

- 1 – Bedroom: T_{mf} 0.6 s
- 2 – Bedroom: T_{mf} 0.5 s
- 3 – Livingroom: T_{mf} 1.1 s.

Based on the above and considering a 2 dB measurement tolerance, with the installed resilient floor, impact noise level transfer in the residential apartment above exceeds internal noise limits with gym free-weights ≥ 25 kg. In addition, it is recommended that free-weight use be limited to daytime use.

It has been confirmed that free-weights use is limited to 25 kg, on this basis, with the current gym free-weights limits and the current gym flooring installed, Planning condition 14 can be discharged.

Other gym equipment

At basement level, there are other gym equipment installed with the potential of causing high levels of structure borne noise transfer and summarised below:

Basement level:

- Box 12 fitness pod with dumbbells up to 15 kg and kettle bells up to 20 kg
- 60 kg tire flip course (tires are covered with a soft material and lane has a resilient finish).

Ground level:

- 4 x lifting machines (on solid floor with no anti-vibration mounts)
- 2 x treadmill machines (on solid floor with no anti-vibration mounts).

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In addition to the above, there are other gym machines that are not considered to have the potential to cause high levels of structure borne noise transfer.

Photographs of other gym machines are shown in Figure 4 (Basement level) and Figure 5 (Ground level).

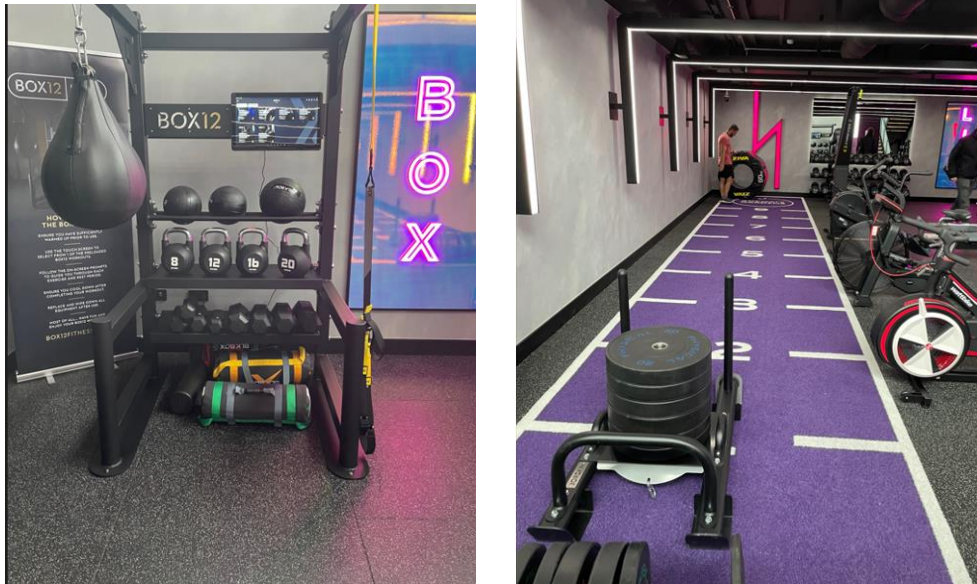


Figure 4 Photographs showing other items of gym equipment with the potential of causing structure borne noise transfer to residential apartment 110 (Basement level)

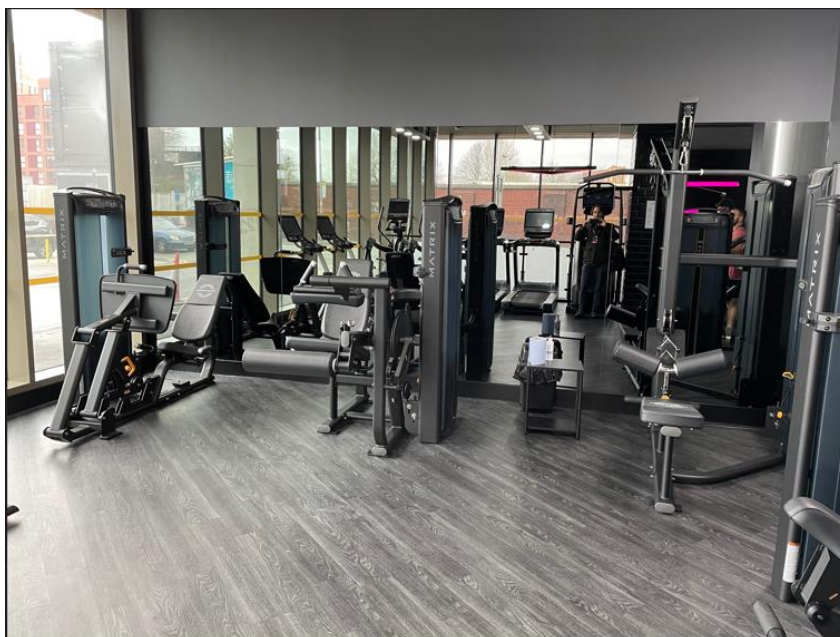


Figure 5 Photographs showing other items of gym equipment with the potential of causing structure borne noise transfer to residential apartment 110 (Ground level)

Amplified sound

The gym facility have installed loudspeakers, however these are not proposed to be in use due to licensing restriction and costs associated.