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Plot 9B, First Street, Manchester

Gym Noise Impact Assessment

March 2025

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1.0 SUMMARY

A planning application has been submitted for purpose-built student residential accommodation at Plot 9B, First Street, Manchester (planning application number 141786/FO/2024). Manchester City Council has requested that additional information is provided in the form of a noise impact assessment that determines the effect of noise breakout and internal noise transfer due to use of the gym, with reference to the document 'ProPG: Gym Acoustics Guidance', published in March 2023.

Fisher Acoustics Ltd has been commissioned by Vita Meadow Limited to compile the required assessment.

An assessment of noise break out from the gym has determined that compliance with external noise limits is expected to be achieved.

Maximum recommended airborne noise levels within the gym have been determined such that compliance with guidance published by Manchester City Council can be achieved.

Impact noise due to the dropping of free weights and weight stacks is to be controlled to acceptable levels by proprietary resilient gym flooring.

2.0 INTRODUCTION

Fisher Acoustics Ltd has been commissioned by Vita Meadow Limited to assess the potential impact of noise from the proposed gym on the ground floor of the proposed purpose-built student residential development at Plot 9B, First Street, Manchester. The development will provide purpose-built student residential accommodation from 1st to 31st floor with communal amenities at ground floor and first floor.

This report responds to a request for additional information in the form of a noise impact assessment that determines the effect of noise breakout and internal noise transfer due to use of the gym, with reference to the document 'ProPG: Gym Acoustics Guidance', published in March 2023.

In particular, the report advises on the maximum allowable internal noise levels within the gym such that compliance with guidance published by Manchester City Council can be achieved.

An assessment of airborne and impact sound transmission from the proposed gym to the residential and non-residential spaces above is also provided.

3.0 DESCRIPTION OF SITE

General Site Description

The proposed development site is Plot 9B of the First Street Development Framework, Manchester.

Plot 9B is bounded by Hulme Street to the south, Medlock Street to the west, an office building currently under construction at Plot 9A to the north and Plot 10A of First Street to the east. Plot 10A has planning approval for an office building.

Other uses around the site include residential buildings, a hotel, offices, the 'Home' arts centre and bars at the northern perimeter of the First Street development.

A main railway route into Manchester centre is located along the northern boundary of the overall First Street development site. Further to the south of the site lies the Mancunian Way (A57(M)).

The Mancunian Way (A57(M)) and Medlock Street are major roads that are heavily trafficked. River Street and Hulme Street are relatively lightly trafficked side streets that provide local access.

Figure 1 shows the site in the context of the surrounding roads and buildings.

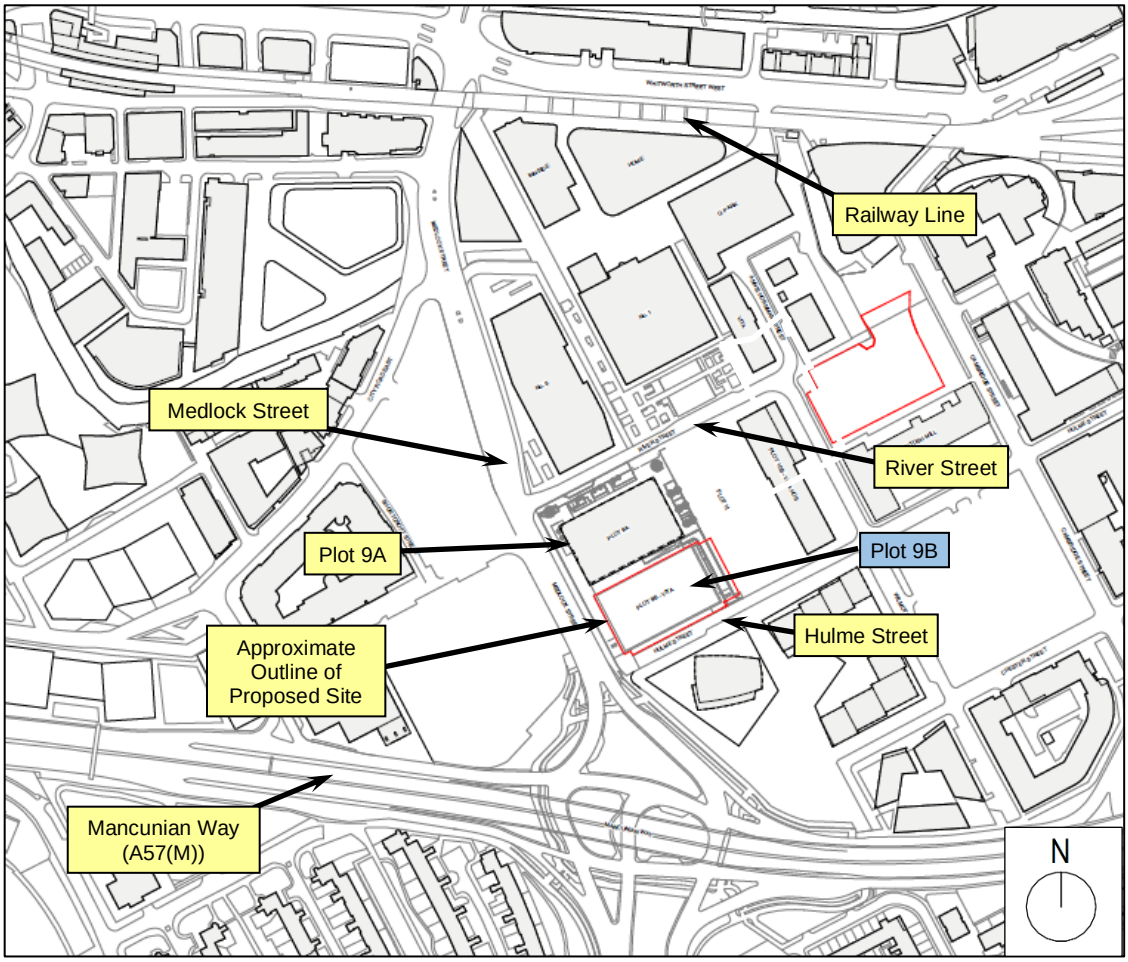


Figure 1: Site location plan – Plot 9B, First Street

4.0 LOCATION OF GYM

The proposed gym is to be located internally on the ground floor of the building on the west elevation of the building (Medlock Street). Figure 2 shows the position of the gym.

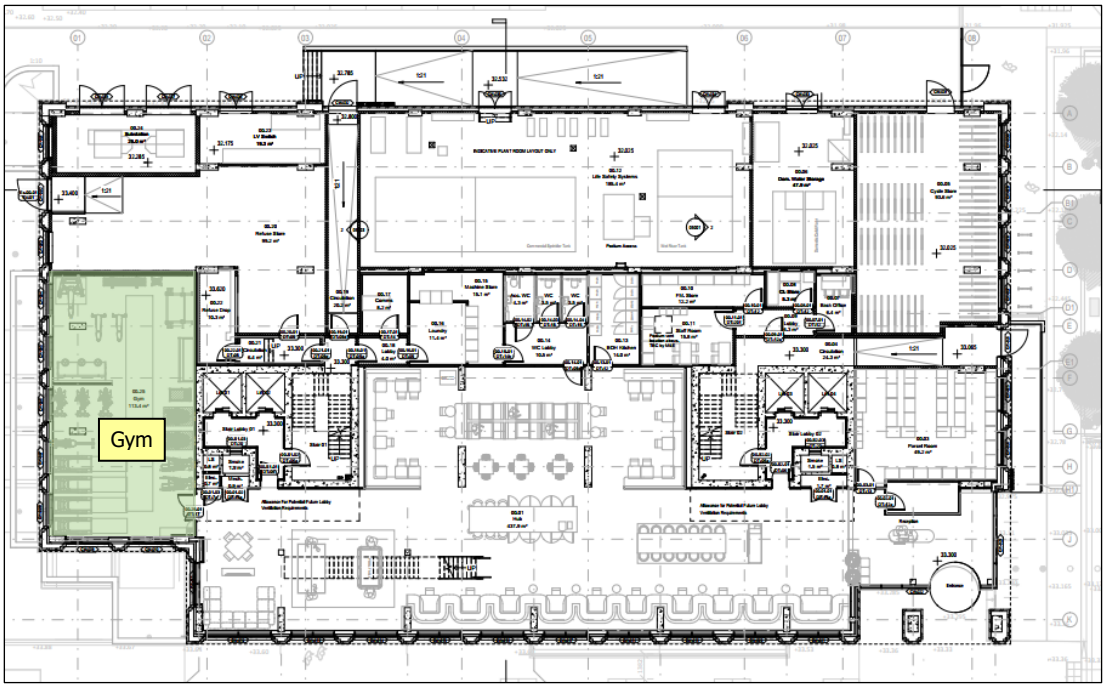


Figure 2: Ground floor plan showing location of gym

Figure 3 shows the 1st floor areas directly above the gym. The footprint of the gym on the floor below is identified in green. It can be seen that the gym is directly below five residential rooms.

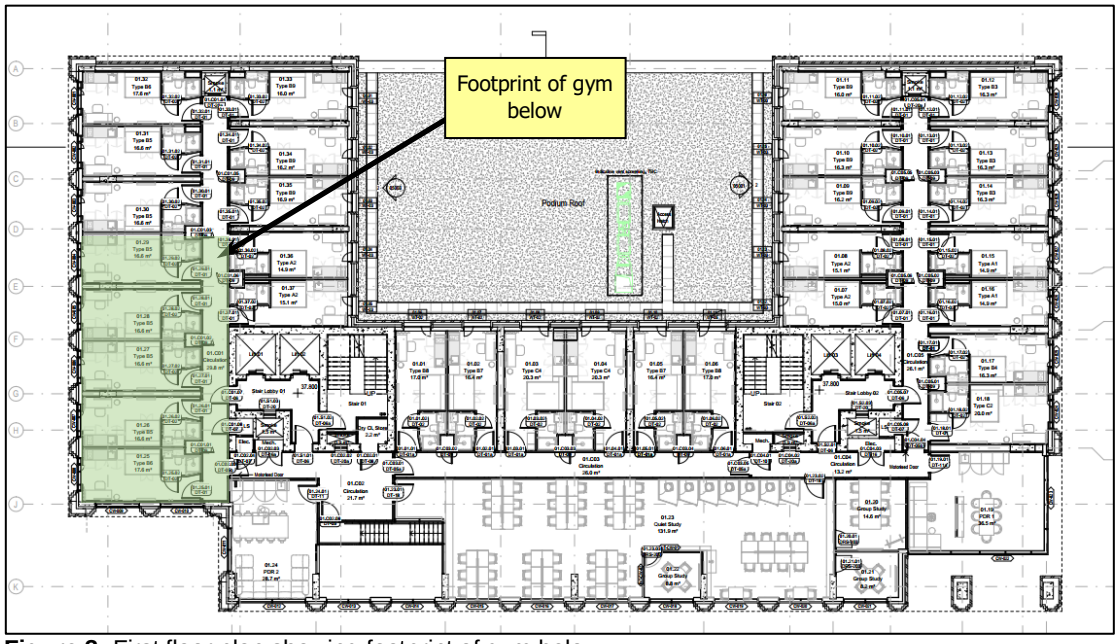


Figure 3: First floor plan showing footprint of gym below

5.0 NOISE SENSITIVE RECEPTORS

Figure 4 identifies the nearest noise sensitive receptors to Plot 9B. The buildings that are not identified as 'noise sensitive receptors' in Figure 4 are at a greater distance from the proposed development than the identified receptors and are subject to similar or greater levels of pre-existing ambient noise. It should be noted that Plot 9B itself is a noise-sensitive receptor due to the residential rooms at and above Level 1 of the building. These residential rooms at Plot 9B are substantially closer to the gym than any other building, such that if satisfactory conditions are expected at the Plot 9B residential rooms, then satisfactory conditions can also be expected at any other buildings.

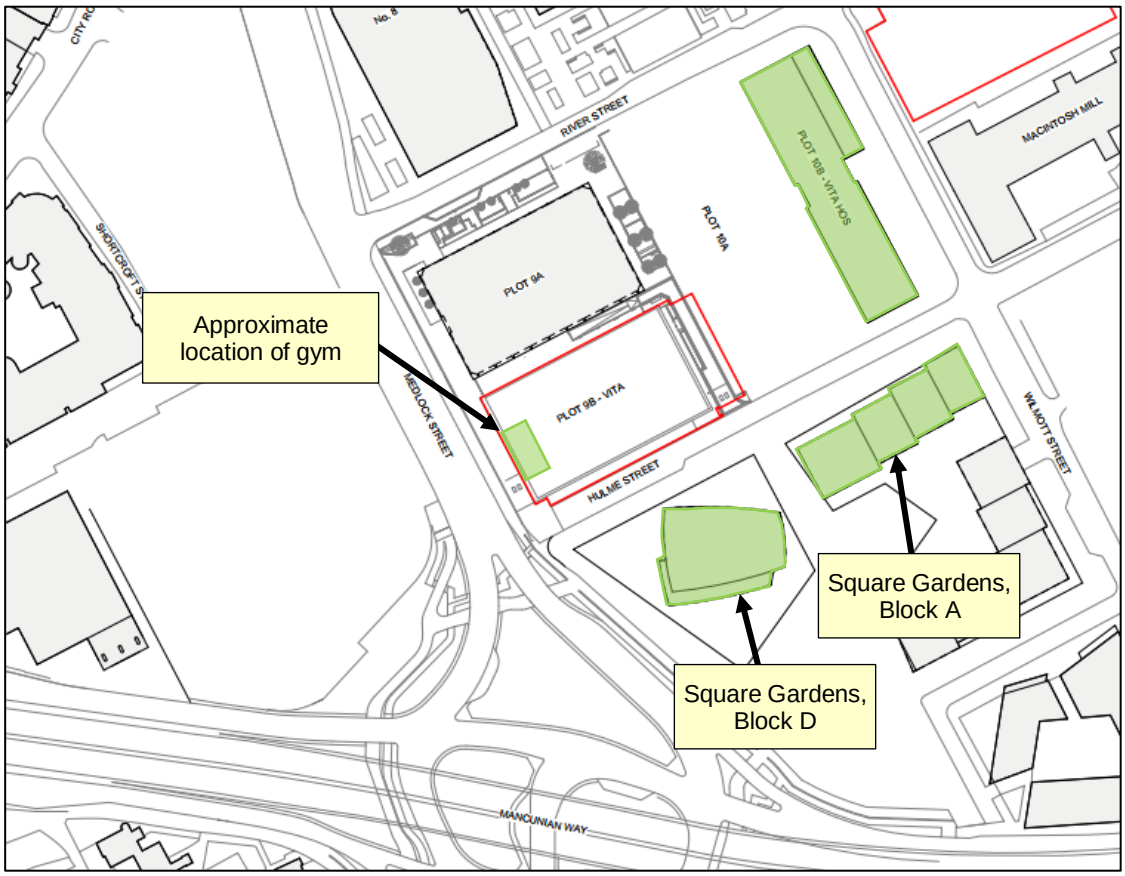


Figure 4: Noise sensitive residential receptors in the vicinity of the development

6.0 ENVIRONMENTAL NOISE SURVEYS AND EXTERNAL NOISE CRITERIA

The Environmental Impact Assessment that was conducted as part of the planning submission for Plot 9B included noise surveys at and around the site. The results of the noise surveys allow the establishment of the maximum allowable external noise levels at the closest noise sensitive receptors due to activity noise breakout from the proposed gym.

Gym activity noise breakout limits

With regard to noise break-out from an 'entertainment venue' to residential properties that are structurally detached, 'Planning & Noise, Technical Guidance' (October 2022) issued by Manchester City Council states:

- 'A planning application for a new entertainment venue that is structurally detached from other building uses should demonstrate that music noise from the proposal will not be 'audible' in nearby residential properties, assuming that the residential properties in question have their windows open. The criterion here is:

  Entertainment noise (LAeq,5 min) should be controlled to 5dB below the typical background noise level (LA90) without the entertainment noise present, in each octave band at the nearest noise sensitive location'.

Although the gym is not an 'entertainment' space, it is to be provided with a sound system with the ability of playing background music. It is therefore appropriate to design to the noise levels identified in the above guidance.

From the results of the external noise surveys reported in the Environmental Statement, the typical lowest background noise levels at the location of the closest receptors to the proposed gym have been determined and are identified in Table 1.

Period	Sound Pressure Level (dB L90) @ Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Daytime (07:00 to 23:00)	59	56	59	59	63	57	44
Night time (23:00 to 07:00)	50	47	49	48	52	46	32

Table 1: Typical lowest background noise levels at sensitive receptors close to the proposed gym

Table 2 identifies the maximum allowable cumulative daytime and night time free-field external noise levels at the closest residential façades due to activity noise from the gym to comply with the guidance published by Manchester City Council.

Period	Sound Pressure Level (dB Leq) @ Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Daytime (07:00 to 23:00)	54	51	54	54	58	52	39
Night time (23:00 to 07:00)	45	42	44	43	47	41	27

Table 2: Maximum allowable external music noise levels due to proposed gym

Although the expected operating hours of the gym are 07:00 to 22:00, night time noise limits have been provided above for completeness.

7.0 INTERNAL NOISE TRANSFER

'Planning & Noise, Technical Guidance', dated October 2022 has been issued by the Environmental Protection, Environmental Health and The Neighbourhoods Service sections of Manchester City Council. The document provides guidance to applicants and consultants concerning the assessment and prediction of environmental noise associated with a particular development.

With regard to entertainment venues, the document states:

- 'When considering the potential impact of a proposal for an entertainment venue, consultants should consider the overall noise level (LAeq) and the 63 Hz and 125 Hz octave band noise levels (Leq). Music noise in the 63 Hz and 125 Hz octave bands, which is often described as "bass noise", is particularly difficult to contain and the impulsive character of this low frequency music noise is particularly disturbing for local residents exposed to it'.

- ….a criterion that would achieve a condition of 'inaudible' / 'virtually inaudible' which is applicable for new residential developments that are structurally connected to entertainment venues (or vice versa) would be:

  'Music noise levels in the 63Hz and 125Hz octave centre frequency bands (Leq) should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB (Leq,5min), respectively'.

Although the gym is not an 'entertainment venue', it is to be provided with a sound system with the ability of playing background music. It would therefore be appropriate to design to the music noise levels identified in MCC's guidance document.

MCC's guidance document does not provide allowable noise levels at frequency bands above 125 Hz. However, section 3.7.1.2 'Entertainment Venues' of the document states that in relation to entertainment noise 'the [NR15] curve may be too stringent at mid and higher frequencies'. It is therefore suggested that at frequency bands above 125 Hz, the allowable noise level in apartments due to entertainment (music) noise from adjoining amenity spaces lies between NR15 and NR20.

With reference to the above, in order to comply with the requirements of condition 12, it is recommended that the internal noise levels within a studio due solely to music replay in the gym does not exceed the values given in Table 3.

Location	Sound Pressure Level (dB Leq) @ Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Studios above gym	47	41	26	20	17	15	12

Table 3: Maximum recommended noise levels in residential studios due to music replay in gym

It should be noted that the values in Table 3 to comply with the recommendations of Manchester City Council are more onerous than the upper noise limits of 'ProPG: Gym Acoustics Guidance' for daytime airborne noise transfer and similar to the upper noise limits of 'ProPG: Gym Acoustics Guidance' for night time airborne noise transfer.

As identified in Figure 3 above, there are five residential studios that lie immediately above the proposed gym and there are other studios on Level 1 in reasonable proximity to the gym. There is therefore the possibility of internal noise transfer between the gym and the apartments above via the party floor structural slab.

The proposed party floor between the gym and the apartments directly above is a 225 mm thick flat concrete slab. Given the party floor slab and associated structures, Table 4 identifies the calculated maximum allowable music noise levels that could be generated in the gym without exceeding the noise limits given in Table 3 in the residential rooms.

Room	Sound Pressure Level (dB Leq) @ Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Gym	83	79	72	73	75	75	80

Table 4: Maximum allowable noise levels in gym– re internal noise transfer

The music noise levels identified in Table 4 would allow background music replay in the gym, whilst achieving compliance with the guidance published by Manchester City Council.

8.0 ACTIVITY NOISE BREAKOUT FROM GYM

Noise egress calculations have been carried out to determine the expected noise level at the closest residential properties due to activity noise breakout from the proposed gym.

The gym is to be a fully mechanical ventilated and cooled space such that the opening of windows and doors is not required to ventilate the space. Therefore, the determinant of the sound insulation performance of the external envelope will be the glazed curtain wall.

The specified weighted sound reduction index of the curtain wall to the gym is 38dB Rw. The expected minimum weighted sound reduction index octave band values of the curtain wall are given in Table 5.

Building element	**Sound Reduction Index (dB) @ Octave Band Centre Frequency (Hz)**						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Gym curtain wall	24	26	29	34	40	41	45

Table 5: Expected sound reduction index of gym curtain wall

Calculations have been carried out to determine the external noise level at the closest residential receptors to the gym on the basis that the allowable internal noise levels given in Table 4 are generated. Table 6 identifies the results of the calculations.

Location	**Sound Pressure Level (dB Leq) @ Octave Band Centre Frequency (Hz)**						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Vita Student, Plot 9B Level 1 studios, west façade	41	25	16	8	5	7	7

Table 6: Calculated external noise levels due to maximum allowable internal noise level – gym

Comparison of the values in Table 2 and Table 6 shows that the calculated external noise levels due to music noise breakout from the gym are lower than the applicable external noise limits. Compliance with both the daytime and night time external noise limits is fully expected given the internal noise levels within the gym.

9.0 IMPACT SOUND TRANSFER FROM GYM

There is the potential for disturbance of residents due to the dropping of weights on the floor of the proposed gym. There is no statutory performance requirement in relation to the transfer of noise from gyms to residential areas. However, guidance has been jointly published by the Institute of Acoustics, the Association of Noise Consultants and the Chartered Institute of Environmental Health. In particular, 'ProPG: Gym Acoustics Guidance', published in March 2023, provides suggested maximum noise levels in residential dwellings due to both airborne and impact noise transfer from gyms.

Table 7 identifies the applicable criteria for residential areas, with reference to 'G curves'. G curves provide a way to reference sound spectra data in a single figure and are detailed in the ProPG document.

Receptor Type	**Guide Criteria**	
	Airborne Sound (e.g. music) Leq, T (31.5Hz to 8kHz)	**Heavy Impact Sound Lmax,F (31.5Hz to 8kHz)**
Residential Areas	G15-G25 (day) G10-G20 (night)	G20-G25 (day) G15-G20 (night)

Table 7: Guidance Internal Sound Target Criteria for Gym Activity – Residential

The ProPG guidance relates to all gyms, including commercial gyms. It could therefore be argued that the guidance is necessarily more onerous than needs to be the case for a gym that is solely for the use of the residents of the building, as the users of a residents-only gym can be instructed in the safe use of weights such that the dropping of weights on the floor does not occur frequently.

To date, the client has applied this method along with the installation of high performance proprietary resilient flooring, to successfully mitigate potential impact noise in numerous developments. On this basis, it would not normally be proposed to design fully for the impact noise targets of the ProPG.

However, it is understood that Manchester City Council's preference is that the guidance values of the ProPG document are designed to.

Figure 5 shows the currently proposed equipment layout within the gym. The proposed free weights area is highlighted.

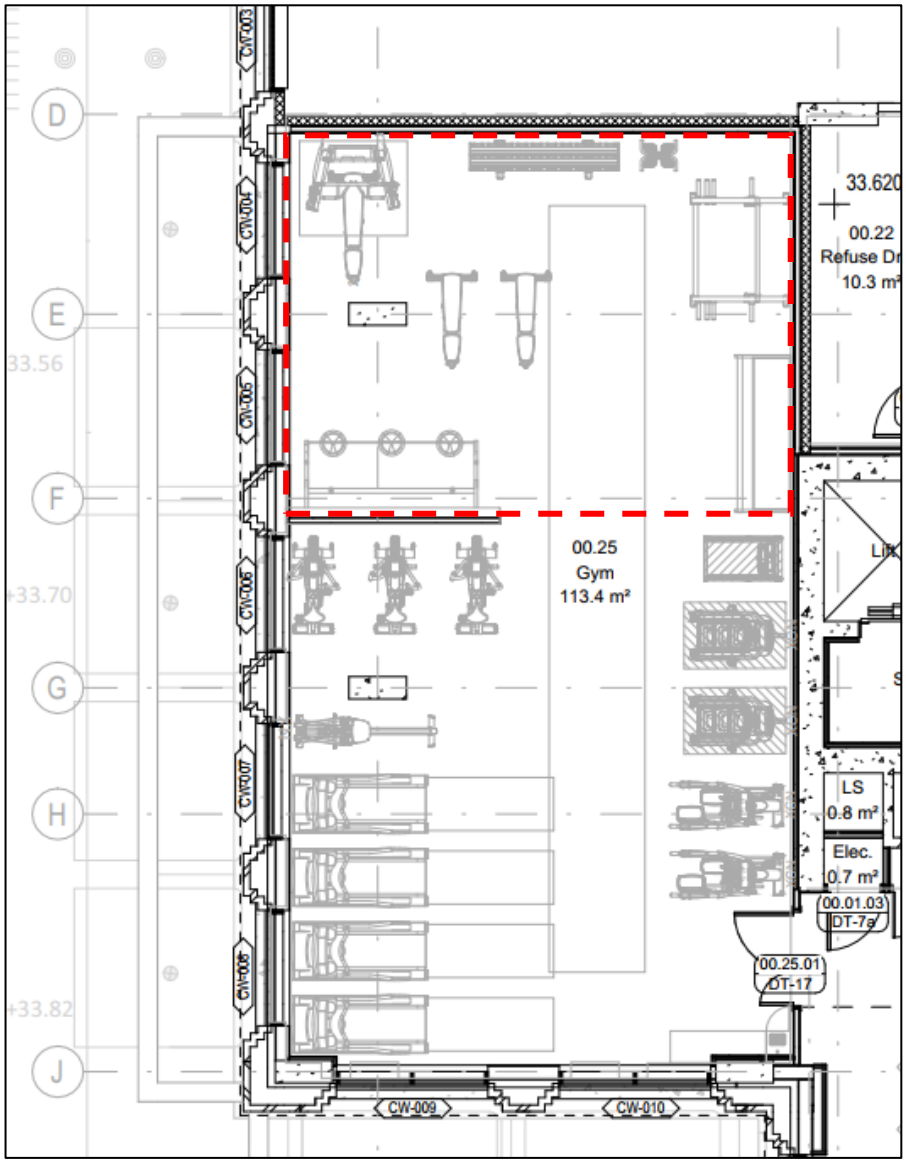


Figure 5: Ground floor, Gym floor plan

Weights area

Reasonable mitigation of impact noise due to the dropping of free weights can be achieved by the installation of proprietary resilient floor coverings in the weights area of the gym.

The proposed resilient floor covering in the weights area identified in Figure 5 is described below.

- GenieMat FIT70 (70 mm thick) on GenieMat FF25 (25 mm thick) by Pliteq

Impact sound testing has been carried out on the proposed gym flooring layers by an independent acoustic consultant within a new-build concrete framed residential building. The results of the tests have been forwarded to Fisher Acoustics by Pliteq.

The tests were carried out to determine the sound levels in the living room of an apartment directly above a residential gym. The tests involved the dropping of a 24 kg kettlebell onto the gym flooring from a height of 0.5 metres.

The tested gym is at first floor level and the floor slab thickness is 200 mm. The gym within Plot 9B is to be on the ground floor slab, which is to be 250 mm concrete, cast on insulation on aggregate. The slab on which the measurements were undertaken is suspended and can therefore be expected to exhibit greater vibration levels due to weight drops than the proposed slab.

Figure 6 identifies the results of the impact sound testing and also identifies the G20 and G25 curves to allow a comparison with the recommendations the ProPG document.

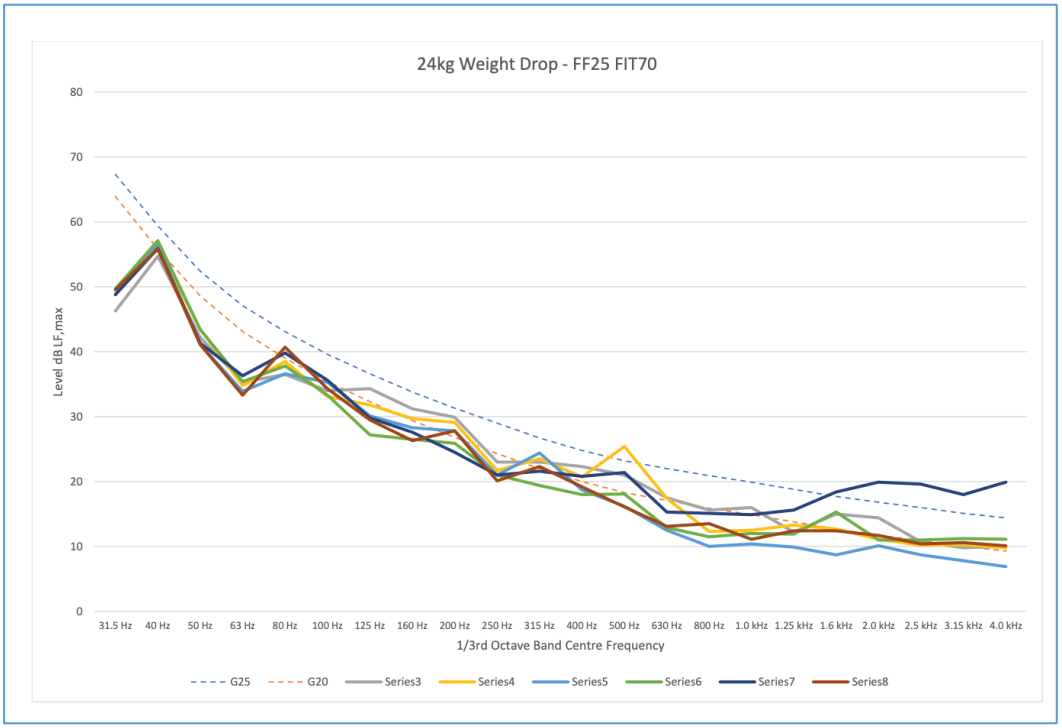


Figure 6: Measured impact sound levels due to 24 kg kettlebell weight drops

It can be seen that the measured low frequency impact sound levels due to the weight drops are less than the G25 curve. The G25 curve is the maximum recommended noise level in residential areas during the day. There are minor exceedances of the G25 curve by single weight drops at higher frequencies. However, these exceedances are not consistent with the other weight drops and it is expected that they were caused by background noise rather than due to weight drops.

Compliance with the recommendations of the ProPG document relating to the dropping of free weights is therefore expected given the proposed floor finish in the weights area of the gym.

'Functional' gym area

The function area of the gym is to be provided with treadmills. With regard to the potential for 'Synchronised Repetitive Excitation' (SRE) of a gym floor and structure due to the use of treadmills, Section 3.5.3 of the ProPG guidance states:

> 3.5.3 SRE Testing Method
>
> Synchronised Repetitive Excitation would typically occur in Gyms where people are running/ stepping together. Estimates of the response factor and complementary heel-drop tests as described in SCI P354 can assist to determine if the structural floor is dynamically sensitive to footfall excitation.
>
> Walk-by or running (with flat-footed style) to a metronome set typically to 160 steps per minute (to represent 11km/hr) are ways that have been used by members of the Working Group to explore this, but it is the experience of the Working Group that this is not commonly done and is usually dealt with by a combination of the isolation within treadmills and also the floor treatment. It should be for the SQA to use their experience to advise in this regard, as it is the Working Group's view that this remains very hard to standardise.

As stated above, the ProPG relies on the 'Suitable Qualified Acoustician' to advise on control of SRE as there is no standardised testing method for treadmills.

Acoustic treatment of treadmills

In the Functional area of the gym, it is recommended that any floor covering achieves a minimum impact sound reduction of 16 dB dLw. Treadmills can be provided with individual isolation pads to reduce the generation of impact noise and vibration propagation to adjacent areas and residential areas above. Suitable products include:

1) TVS Impact Absorbers
2) Pliteq GenieMat TMIP (treadmill isolators)

Notwithstanding the above advice, the generation of SRE has not been reported in any similar residential gym to that proposed within concrete framed buildings.

10.0 CONCLUSION

The expected internal noise levels within the gym are such that compliance with guidance published by Manchester City Council in relation to internal noise transfer and external noise breakout is fully expected.

Potential impact noise from the gym due to the dropping of weights is to be controlled by the provision of high performance proprietary resilient gym floor coverings specifically designed to reduce low frequency impact noise, such that acceptable levels of noise are expected in the residential areas above the gym.

Adverse impacts due to Synchronised Repetitive Excitation of the gym structure is not expected given the proposed structure and the option to install treadmill isolation pads if necessary.