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Anytime Fitness Ladbroke Grove Noise Impact Assessment 03102016 R1.pdf

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For:
David ODonnell
Anytime Fitness Ladbroke Grove

Report Title:
ANYTIME FITNESS LADBROKE GROVE

NOISE IMPACT ASSESSMENT

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<td>Tim Scott</td>
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INTRODUCTION

A new Anytime Fitness gym is to be located within the ground floor and basement level of Unit 3, Grand Union Studios, 332 Ladbroke Grove, London, W10 5AS. The Grand Union Studios and proposed gymnasium are situated within the Royal Borough of Kensington and Chelsea. Gillieron Scott Acoustic Design (GSAD) have been commissioned to undertake an acoustic assessment in accordance with Local Authority requirements.

Acoustically sensitive premises in close proximity to the proposed gym have been identified. Office spaces are located above the ground floor of Unit 3 and share a party ceiling / floor construction. Meeting rooms are located to the south of Unit 3 and are separated by a single party wall construction and circulation space. Residential dwellings at the Grand Union Centre that are in close proximity to the unit were noted to have an entirely independent wall from that of all commercial units at Grand Union Studios, therefore, internal airborne and structure-borne acoustic transmission tests were not deemed necessary between Unit 3 and these dwellings. The site location is shown in Appendix A.

Noise from sound systems, typical gym usage such as free weights, running machines or group classes have been assessed and design targets have been set to minimise the likelihood of complaints arising from adjoining premises.

Services equipment is to be installed within a large enclosed car park at the basement level of Grand Union Studios. The nearest residential receptors are positioned approximately 75m away and benefit from acoustic screening from this proposed plant location. An indicative plant noise impact assessment indicates a low impact within the context of the surrounding area.

The findings of this assessment are presented in the following sections of this report together with the supporting figures and appendices.

1.0 BRIEF

- Identify noise sensitive premises located in the vicinity of the site and assess the topography of the intervening ground.

- Undertake airborne and weight-drop impact sound transmission from the proposed Anytime Fitness gymnasium to adjoining premises.

- Analyse the site-acquired data and determine the appropriate noise criteria to adopt from the Royal Borough of Kensington and Chelsea’s noise policy.

- Provide a technical report detailing findings of the survey and provide appropriate noise mitigation measures, where required, to mitigate internal noise transfer from gym usage and sound systems to ensure design targets are met.
2.0 SUMMARY

2.1 Noise from gym usage and sound systems

Similar to other ATF gyms, the fit-out and gym usage plans assume the following measures have been taken to control noise:

- All machines will be fitted with earphone sockets so members can use sound functions without disturbing others.
- Free weights kit will have absorbing mounts.
- On-site weight-drop tests have confirmed 1 x 10mm Jaymart Blade-Runner resilient floor build-up will be required to control impact sound in the dumbbell area. An example data sheet for 10mm Jaymart Blade-Runner is shown in Appendix E. It is understood that a higher performance 42mm Sportec Style Tile will be installed within the dumbbell area to further mitigate impact sound over and above typical recommendations.
- On-site airborne acoustic testing of the party wall and floor / ceiling constructions with adjoining commercial premises has confirmed that no acoustic upgrades are required for typical gym activities to occur.
- Strict management control and CCTV monitoring of patrons unreasonably dropping weights onto the flooring in a deliberate manner. Typical policy below:

  “As a policy for Anytime Fitness we will do our best to ensure that members do not drop cable station weights for any undue reason. Frequent abusers will be warned and if they do not stop, will have their memberships revoked. With video monitoring in use, any unmanned hours can be monitored post any reported event. Any complaint received we will review the video footage and members contacted to prevent this from being an issue in the future. We will also have a list of member rules and club etiquette clearly visible for all members to view.”

- On first opening of gym, music sound levels will be set and locked to those specified in Section 6 to ensure design targets are met in all adjoining premises and that music is inaudible in surrounding residential dwellings. Octave band music sound levels to meet this criteria are defined within this report in section 6.1.1.
- Gym windows being non-openable and specified to ensure external noise levels meet design criteria. Comfort cooling to be provided by air conditioning.
- Position weight stacks or high impact elements away from party walls to avoid structure borne transmission of impact noise.
- Boxing to soil vent pipes.

GSAD expect that if these measures are incorporated into the design, the likelihood of complaints will be low.
3.0 NOISE ASSESSMENT CRITERIA

3.1 Noise from gym usage and sound systems

The noise emanating from the user activities within the gym such as free weights, running machines or group classes into structurally adjoining residences/commercial premises will be designed to meet BS 8233:2014 recommended internal noise levels at all times.

Noise from amplified music systems will be set so that it is inaudible within surrounding and structurally adjoining premises at all times.

3.2 British Standard BS 8233:2014

British Standard BS 8233:2014 provides information on the design of internal acoustics in buildings. The document gives recommended internal noise levels in Commercial Buildings. The recommendations are shown below.

Taken from BS 8233 (2014) ‘Guidance on sound insulation and noise reduction for buildings’.

Table 1 – BS 8233 Recommended Internal Noise Levels in Commercial Buildings

<table>
<thead>
<tr>
<th>Objective</th>
<th>Typical situations</th>
<th>Design range $L_{Aeq,T}$ dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical noise levels for acoustic privacy in shared spaces</td>
<td>Restaurant</td>
<td>40 – 55</td>
</tr>
<tr>
<td></td>
<td>Open plan office</td>
<td>45 – 50</td>
</tr>
<tr>
<td></td>
<td>Night club, public house</td>
<td>40 – 45</td>
</tr>
<tr>
<td></td>
<td>Ballroom, banqueting hall</td>
<td>35 – 40</td>
</tr>
<tr>
<td></td>
<td>Living room</td>
<td>35 – 40</td>
</tr>
</tbody>
</table>

NOTE See Noise control in building services [28] and BS EN ISO 3382.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Location</th>
<th>Design range $L_{Aeq,T}$ dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech or telephone communications</td>
<td>Department store, Cafeteria, canteen, kitchen</td>
<td>50 – 55</td>
</tr>
<tr>
<td></td>
<td>Concourse, circulation space</td>
<td>45 – 55</td>
</tr>
<tr>
<td>Study and work requiring concentration</td>
<td>Library, gallery, museum</td>
<td>40 – 50</td>
</tr>
<tr>
<td></td>
<td>Staff/meeting room, training room</td>
<td>35 – 45</td>
</tr>
<tr>
<td></td>
<td>Executive office</td>
<td>35 – 40</td>
</tr>
<tr>
<td>Listening</td>
<td>Place of worship, counselling, meditation, relaxation</td>
<td>30 – 35</td>
</tr>
</tbody>
</table>

From the tables above, the recommended internal noise level for open plan offices of 45-50 dB $L_{Aeq,T}$ and staff/meeting rooms 35-45 dB $L_{Aeq,T}$ have been selected as the most appropriate design ranges for the commercial units positioned adjacent to the proposed gymnasium. 45 – 50 dB can be approximately equated to a Noise Rating Curve with the relationship NR = dB $L_{Aeq,T} – 6$. The appropriate design criteria for offices positioned above the proposed gymnasium is, therefore, NR39 – NR44. 35 – 45 dB can be approximately equated to a Noise Rating Curve with the same relationship,
providing design criteria for meeting rooms positioned in close proximity to the proposed gymnasiunm as NR29 – NR39.

### 3.2 Local Authority Planning Conditions


#### 3.2.1 Scheme of Sound Insulation

“The use of the property as a gym shall not commence before a scheme of sound insulation, designed to prevent the transmission of excessive airborne noise between the lower/upper ground floor unit and the adjacent residential dwellings on the ground and first floor to the east and the offices above has been submitted to and approved in writing by the Local Planning Authority. The airborne sound insulation performance shall achieve as a minimum a 5dB increase over the minimum requirements of Approved Document E of the Building Regulations 2010. The sound insulation shall be installed prior to the commencement of the restaurant use and maintained only in accordance with the details so approved. Reason - To prevent any significant disturbance to residents of nearby properties and comply with development plan policies, in particular policy CL5 of the Consolidated Local Plan. compliance with the condition is required before the commencement of the use because compliance with the requirements of the condition at a later time would result in unacceptable harm to neighbour’s living conditions contrary to the policies of the Development Plan.”

In order to dispense the above planning condition, the measured airborne acoustic separation between the proposed gymnasiunm and all adjacent properties must be equal to or exceed 50 dB $D_{nTw} + C_{tr}$. Measured results presented within this report show that all party partitions meet Local Authority requirements.

It was noted on site that the residential premises located adjacent to the proposed gymnasiunm do not share a party wall with Unit 3 as the walls are independent of each other. A cautious prediction of the acoustic performance across the separate walls of Unit 3 and adjacent residential premises has been carried out in Insul, a sound insulation prediction software. Details of the prediction and its results are presented in Appendix H.

#### 3.2.2 No music audible outside

“No music, musical instruments, or loudspeakers shall be played or used within the premises forming the subject of this permission so as to be audible outside the premises. Reason - To prevent any significant disturbance to residents of nearby properties and comply with development plan policies, in particular policy CL5 of the Consolidated Local Plan.”

The airborne acoustic performance of the proposed gymnasiunm doors to the courtyard at Grand Union Studios / Centre has been measured, as this is the weakest acoustical path for the breakout of activity noise within the premises to the surrounding residential dwellings. The background sound level within the courtyard has also been measured. Maximum permitted music sound levels have been defined in octave bands within this report in order to ensure that any low level music played within the gym is 10 dB below the background sound level at all surrounding residential facades. Any low level music playback will only occur during staffed hours, 0700-2300. This condition can be discussed with the Local Authority, if required.
4.0 ACOUSTIC TESTING AND SURVEYS

4.1 Noise from gym usage and sound systems

Airborne sound and structure-borne impact sound acoustic transmission testing of the separating construction and proposed impact isolation products has been undertaken to ensure that noise emanating from the gym meets the specified design targets from section 3 of this report. These tests have been carried out in order to minimise the likelihood of complaints arising from the adjoining commercial premises.

4.2.1 Airborne sound testing

Airborne sound insulation tests were carried out with regard to BS EN ISO 140-4 and Annex B of the Approved Document E in Building Regulations 2003 (as amended).

- A continuous and steady spectrum of pink noise was generated through one loudspeaker in the source room.
- The sound pressure level (SPL) in the source and the receiving rooms was sampled for at least 30 seconds using a moving microphone to obtain the spatial average SPL.
- The noise source was moved to a second position and the sampling process repeated.
- Background noise levels were also measured in the receiving room for at least 30 seconds using a moving microphone.
- Reverberation times have been estimated in receiver rooms in order to avoid disturbance to the adjoining commercial premises.

As per Annex B of ADE, for each loudspeaker position the level difference between the two rooms is determined and the two (or more) differences averaged to arrive at the mean difference \( D \) for each third-octave band. Subsequently the standardised level difference \( D_{nT} \) is calculated:

\[
D_{nT} = D + 10 \log \frac{T}{T_0} \text{ dB}
\]

Where

- \( D_{nT} \) is the standardised level difference
- \( D \) is the mean level difference
- \( T \) is the reverberation time (RT) measured
- \( T_0 \) is the reference RT (0.5 seconds)

The results were subsequently rated in accordance with BS EN ISO 717-1 to obtain the weighted standardised level difference \( D_{nT,w} \) and the spectrum adaptation terms \( C \) and \( C_{tr} \).

Airborne sound transmission tests were carried out between the proposed gym, an unoccupied office space positioned above and a meeting room to the south.
4.2.2 Impact Sound Transmission

Three impact isolation mat build-ups were tested in one location within the basement level of the proposed gym during the survey:

- 10mm Blade-Runner
- 10mm Blade-Runner + 1x15mm Regupol
- 30mm GenieMat FIT30

Samples of impact isolation matting were placed directly on the floor. A single large dumbbell weighing 25kg was dropped onto the samples of impact isolation matting from a standardised height of approximately 1m while the resultant noise level was measured within adjoining premises.

The weight-drop testing location is indicated in Appendix D.

The results of the impact testing are presented in Tables 4 and 5.

It is understood that the free weights area will contain weight benches and racks for dumbbells. There will be no designated area for dropping weights. It is the standard policy of Anytime Fitness that it is not permitted to unreasonably drop dumbbells from any height. This is closely managed via onsite staff, CCTV monitoring and with signage in appropriate areas and as such should be a rare event.

4.2.3 Weights Machines

There were no weights machines on site at the time of testing. Based on tests previously undertaken at similar sites, dumbbell drops are more energetic than weight machine use therefore represent a worst case scenario.

4.2.4 Treadmills

Although there were no treadmills on site at the time of testing, tests has been previously undertaken at a similar site. The staff were asked to use two of the treadmills at their normal running paces. The noise associated with their use was inaudible in adjoining properties.
5.0 SURVEY RESULTS

5.1 Noise from typical gym usage and sound systems

5.1.1 Airborne Sound Transmission

Airborne sound insulation was measured between the ground floor of the proposed gym, office space positioned above and a meeting room located to the south. The receiver rooms used for the acoustic testing are shown in Appendix D. Table 2 shows the results of the airborne sound separation measured on site.

Table 2: Sound Transmission Test Results.

<table>
<thead>
<tr>
<th>Source room</th>
<th>Receiving room</th>
<th>$D_{nT,w} + Ctr$ (dB)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Floor</td>
<td>Office Space, First Floor</td>
<td>&gt;53</td>
<td>Unoccupied Office, Ventilation Systems Switched Off, Noticeable Leak, Result Will Improve Once Pipes Penetrating Partition Are Boxed In As Per Section 2.1</td>
</tr>
<tr>
<td>Proposed Gym</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposed Gym</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.1.2 Impact Sound Transmission from Dumbbell area

The results of impact testing carried out between the gym and adjoining commercial premises is presented in section 6.2.2.

5.2.3 Impact Sound Transmission from Machines

No machines are currently installed at the site.

From tests undertaken at a similar site, it is likely that the use of the machines would generally be inaudible, with a few occasions of low level low frequency noise being perceptible. The noise levels occurring at this similar site were too low to accurately measure.
6.0 ACOUSTIC ASSESSMENTS

6.1 Noise from gym usage and sound systems

6.1.1 Noise from sound systems

Measurement of airborne sound insulation between the ground floor of the proposed gym, office space above, meeting room to the south and break-out to external via doors to the courtyard allows maximum permitted music levels to be calculated. These levels have been defined to ensure design criteria in section 3 is met for all adjoining premises and nearby residential premises. These maximum levels are presented in Table 3 below.

Table 3 – Limited levels for music playback in the gym and studio

<table>
<thead>
<tr>
<th>Octave Band Sound System Limits</th>
<th>Overall dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unweighted Octave Bands</td>
<td>63 Hz</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>79</td>
<td>78</td>
</tr>
</tbody>
</table>

On first opening of the gym, locking music sound levels to a maximum of the values in the table above will minimise the risk of complaint from the adjoining premises. These levels have been calculated based on the measured acoustic performance of the doors of the proposed gym to the courtyard area and the background sound level measured adjacent to residential premises overlooking the courtyard to ensure music playback within the gym is inaudible at all surrounding residential dwellings.

It was observed on site that the double doors servicing the gym from the courtyard had noticeable acoustic weak-points due to slightly loose paving close to the frame of the left hand side door (looking towards unit 3 from the courtyard). This loose paving gave rise to a leak below the frame of the door. Once fixed, higher music sound levels may be permissible within the premises while still maintaining inaudibility at all residential dwellings.

6.1.2 Impact sound transmission from weight drops/ dumbbells

Testing has taken place on three isolation matting build-ups. Tests have determined that weight drop events within the dumbbell area in the gym will have a low level of audibility at very low frequencies in the surrounding commercial premises.

The results of impact testing carried out between the basement level dumbbell area and the meeting room is presented in Table 4 below.

Table 4 - Impact Sound Transmission Test Results to Meeting Room

<table>
<thead>
<tr>
<th>Source room</th>
<th>Receiving room</th>
<th>Isolation mat Build-up</th>
<th>Noise Rating Curve</th>
<th>Meets NR29-39 Criteria? Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Gym, Basement Level</td>
<td>Meeting Room, Ground Floor</td>
<td>Blade-Runner 10mm</td>
<td>27</td>
<td>Y</td>
</tr>
<tr>
<td>Proposed Gym, Basement Level</td>
<td>Meeting Room, Ground Floor</td>
<td>Blade-Runner 10mm + 15mm Regupol</td>
<td>19</td>
<td>Y</td>
</tr>
<tr>
<td>Proposed Gym, Basement Level</td>
<td>Meeting Room, Ground Floor</td>
<td>GenieMat FIT30</td>
<td>16</td>
<td>Y</td>
</tr>
</tbody>
</table>

Notes: weight-drops had a low level of audibility at very low frequency. Background noise levels regularly exceeded those due to weight-drop events.
The results of impact testing carried out between the basement level dumbbell area and the first floor office space is presented in Table 5 below.

### Table 5 - Impact Sound Transmission Test Results to Office Space

<table>
<thead>
<tr>
<th>Source room</th>
<th>Receiving room</th>
<th>Isolation mat Build-up</th>
<th>Noise Rating Curve</th>
<th>Meets NR39-44 Criteria? Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Gym, Basement Level</td>
<td>Office, First</td>
<td>Blade-Runner 10mm</td>
<td>34</td>
<td>Y</td>
</tr>
<tr>
<td>Proposed Gym, Basement Level</td>
<td>Office, First</td>
<td>Blade-Runner 10mm + 15mm Regupol</td>
<td>29</td>
<td>Y</td>
</tr>
<tr>
<td>Proposed Gym, Basement Level</td>
<td>Office, First</td>
<td>GenieMat FIT30</td>
<td>28</td>
<td>Y</td>
</tr>
</tbody>
</table>

Notes: weight-drops had a low level of audibility at very low frequency. Background noise levels regularly exceeded those due to weight-drop events.

From the tests undertaken, it has been found that single layer of Jaymart Blade-Runner 10mm will suitably mitigate noise from weight-drops within the free-weights and dumbbell area at basement level to meet noise criteria for both the ground floor meeting room and office space on the first floor. It is understood that higher performance 42mm Sportec Style Tiles will be installed within the dumbbell area of the gymnasium. This alternative resilient impact isolation flooring product has been tested in a number of other gymnasiums and the performance has exceeded that of 10mm Jaymat Blade-Runner in all instances.

As per section 2.1, due to the policy adopted by Anytime Fitness on the strict non-tolerance of weight dropping, it is unlikely that events will occur regularly.

In the unlikely event that complaints do arise due to weights being dropped, GSAD will provide details of additional isolation matting layers to increase the build-up to suitably mitigate.

#### 6.1.3 Separating partitions

Party wall construction between the proposed gym premises and the ground floor meeting room was observed to be blockwork, with circulation space acting as an additional acoustical buffer space. As shown in Table 2 in Section 5.1.1, the on-site airborne acoustic performance, including additional attenuation afforded by circulation spaces situated between the proposed gym and the meeting room has been measured as 65 dB $D_{nTw}$ + $C_{tr}$. Further upgrades to party walls are not necessary in order to meet design targets within any meeting rooms. Local Authority requirements from Section 3.2.1 have also been met.

The party floor / ceiling construction between the ground floor of the proposed gym and the office spaces above has been observed to be concrete slab. As shown in Table 2 in Section 5.1.1, the on-site airborne acoustic performance has been measured as $>$53 dB $D_{nTw}$ + $C_{tr}$ however, a penetration in the partition was identified where a pipe passes through the partition, giving rise to a lower measured performance than will be achieved once all soil vent pipes are boxed in as per Section 2.1. Further upgrades to the party floor / ceiling construction are not necessary in order to meet design targets within office spaces positioned above the ground floor of the proposed gym. Local Authority requirements in Section 3.2.1 have also been met.
It was observed on site that the wall of adjacent residential dwellings and that of Unit 3 are both independent of each other. Measurements of the airborne acoustic separation between these spaces were, therefore, not deemed necessary. An indicative prediction of the performance has been carried out in the Insul sound insulation prediction software package. Assumptions as to the construction of both independent walls used in the prediction have been conservative, in order to err on the side of caution. Details of these assumptions and the details results of the prediction are shown in Appendix H. The overall lab based prediction calculated within the Insul software package is 81 dB R_w. The likely real world in-situ performance is typically circa 13 dB below the lab based prediction, giving a predicted performance of approximately 68 dB D_{ntw} + C_{tr}. Local Authority requirements defined in Section 3.2.1, therefore, will be met for all adjoining premises and no upgrades to any partitions will be necessary.

6.2 External plant

A plant noise impact assessment in accordance with BS4142: 2014 has not been deemed necessary by the Royal Borough of Kensington and Chelsea for new services equipment being installed at the site, however, an indicative assessment has been carried out.

6.2.1 Context

The residential dwellings that will be most affected by new items of plant installed within the basement car park of Grand Union Studios are located approximately 75m from the proposed plant location. The residential properties are fitted with double glazing and trickle ventilators. Ladbroke Grove is positioned to the west of site and noise sensitive receptors and services a moderate to high road traffic flow, with a reasonable percentage of Heavy Goods Vehicles (HGVs). Bus Stops are also located adjacent to site, and a regular service has been observed to use this road.

Numerous train lines are located to the south of residential receptors. Train pass-by events are audible at the residential dwellings.

Other sources of noise include air traffic noise. Subjectively, road traffic noise dominates the acoustic environment at the most affected noise sensitive receptors and the ambient sound levels at the assessment location at the eastern façade are in line with an urbanised area.

Three units of mechanical plant which are to be installed within the large underground car park at Grand Union Studios at basement level. The nearest residential dwellings are positioned a total distance of approximately 75m away and have no line of sight to the proposed units. It is envisaged that these unit(s) will have the facility to operate 24 hours a day, in line with the opening hours of the gym. The indicative plant noise impact assessment has been carried out in Table 6 below.
An indicative plant noise impact assessment has been carried out in the table above in line with Local Authority noise policy. A rating level of 31 dB(A) @ 1m from the most affected residential façade has been determined. The rating level is 8 dB below the typical background sound level which is an indication of a low impact within the context of the acoustic environment which is prevalent at the worst affected residential dwelling.

The specific plant item model numbers, their associated sound pressure levels at maximum duty and the cumulative sound pressure level from all three proposed condensing units are presented in Appendix C. An explanation for applying the acoustic feature corrections is provided in Appendix G.

### Table 6 – Indicative Plant Noise Impact Assessment

<table>
<thead>
<tr>
<th>Element</th>
<th>Level</th>
<th>Change</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Sound Pressure Level</td>
<td>59 dB(A) @1m</td>
<td></td>
<td>Cumulative sound pressure level @ 1m from all three Mitsubishi condensing units. Unit model numbers and individual sound pressure levels provided by the manufacturer are shown in Appendix C</td>
</tr>
<tr>
<td>Acoustic Feature Corrections</td>
<td>64 dB</td>
<td>+5</td>
<td>+ 2 dB for tonality, + 3 dB for intermittency, See Appendix G</td>
</tr>
<tr>
<td>Reflective Surfaces</td>
<td>67 dB</td>
<td>+3</td>
<td>1 acoustically hard reflective surface in close proximity to units</td>
</tr>
<tr>
<td>Reverberant Level</td>
<td>76 dB</td>
<td>+9</td>
<td>Units located within a semi enclosed space, creating a reverberant sound field</td>
</tr>
<tr>
<td>Distance Attenuation</td>
<td>38 dB</td>
<td>-38 dB</td>
<td>Point source distance attenuation over approximately 75m</td>
</tr>
<tr>
<td>Acoustic Screening</td>
<td>28 dB</td>
<td>-10 dB</td>
<td></td>
</tr>
<tr>
<td>Façade Level</td>
<td>31 dB</td>
<td>+3</td>
<td>Incident and reflected sound energy</td>
</tr>
<tr>
<td>Rating Level</td>
<td>31 dB(A) @1m</td>
<td></td>
<td>The assessment has predicted a Rating Level at the worst affected residential dwelling of 31 dB(A) @ 1m</td>
</tr>
<tr>
<td>Typical Background Sound Level</td>
<td>39 dB</td>
<td></td>
<td>Typical Night-time Background Sound Level LA90,15min,2300-0700</td>
</tr>
<tr>
<td>Assessment Indication</td>
<td>Low Impact</td>
<td></td>
<td>A Rating Level that is 8 dB below the typical background sound level is an indication of a low impact in the context of the surrounding area and its acoustic environment. Other sources of noise regularly give rise to higher noise levels such as road and air traffic and cars entering / leaving the car park at Grand Union Studios</td>
</tr>
</tbody>
</table>
6.0 CONCLUSION

Airborne acoustic separation has been measured between the proposed gym premises at Unit 3 Grand Union Studios, 332 Ladbroke Grove, London, W10 5AS, and adjoining commercial premises. It has been found that the existing acoustic performance of the separating wall partitions and separating floor / ceiling construction is adequate and that no further upgrades to party walls or floors are required to meet design criteria or Local Authority requirements defined in Section 3.2.1.

Airborne acoustic separation between Unit 3 and adjacent residential premises has been predicted in the Insul software package and it has been found that the likely in-situ $D_{ntw} + C_r$ performance exceeds Local Authority requirements defined in Section 3.2.1.

Weight-drop impact sound testing has been carried out between Unit 3 and adjoining commercial premises. Tests have found that a single layer of 10mm Jaymart Blade-Runner will suitably mitigate noise and vibration transmission between the proposed gym and adjoining premises. It is understood that a 42mm Sportec Style Tile will be installed at the site. This high performance alternative resilient impact isolation product has been tested on other sites and the measured reduction in weight-drop impact sound has been higher than 10mm Jaymay Blade-Runner in all instances. There should be no reason, therefore, that the condition imposed upon the scheme of sound insulation, as defined in Section 3.2.1 is not dispensed.

An indicative plant noise impact assessment has been carried out based on the topography of the intervening ground between newly proposed plant items and noise sensitive residential dwellings. The plant noise impact assessment has found that the Rating Level is predicted to be 8 dB below the typical night-time background sound level, indicating a low impact within the context of the acoustic environment at the worst affected residential dwelling.
APPENDICES
APPENDIX A - Site Location & Unit 3 Demise

Unit 3 demise, ground floor and partial basement level

Proposed plant location within car park at basement level. 3 Mitsubishi condensing units. See Appendix C for manufacturer supplied noise data

Most affected noise sensitive residential receptor, first floor
APPENDIX B – Plant Location

Proposed plant location. 3 Mitsubishi condensing units with car park at basement level. See Appendix C for manufacturer supplied noise data.

Opening / entrance to basement level car park located approx. 63m from nearest condenser.
APPENDIX C – Manufacturer Supplied Noise Data

**Air Conditioning**

<table>
<thead>
<tr>
<th>System 1</th>
<th>FDT200VSTV</th>
<th>FDT71VF1 (3no.)</th>
<th>MITSUBISHI FDC200VS – 57 dB(A) @ 1m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor Unit</td>
<td>FDT71VF1</td>
<td>FDC200VS</td>
<td></td>
</tr>
<tr>
<td>Outdoor Unit</td>
<td>FDC200VS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling Capacity</td>
<td>20kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating Capacity</td>
<td>22.4kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>RC-EX1A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System 2</th>
<th>FDT140VNXPVF1</th>
<th>FDT71VF1 (1no.)</th>
<th>MITSUBISHI FDC71VNX – 51 dB(A) @ 1m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor Unit</td>
<td>FDT71VF1</td>
<td>FDC140VNX</td>
<td></td>
</tr>
<tr>
<td>Outdoor Unit</td>
<td>FDC71VNX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling Capacity</td>
<td>14kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating Capacity</td>
<td>16kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>RC-EX1A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System 3</th>
<th>FDEN71VNXVF1</th>
<th>FDEN71VFX1</th>
<th>MITSUBISHI FDC71VNX – 51 dB(A) @ 1m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor Unit</td>
<td>FDEN71VFX1</td>
<td>FDC71VNX</td>
<td></td>
</tr>
<tr>
<td>Outdoor Unit</td>
<td>FDC71VNX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling Capacity</td>
<td>7.1kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating Capacity</td>
<td>8.0kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>RC-EX1A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Noise data for all three units assumes high duty

Cumulative noise emission limit from all three units 59 dB(A) @ 1m
APPENDIX D – Proposed Gym Layout and Mitigation Measures

First Floor Office positioned above used as receiver room for Airborne and Impact tests

Meeting Room, Ground Floor, receiver room for Airborne and Impact tests

Weight-Drop Test Position

Resilient floor build-up to control impact sound transmission in dumbbell area. See Appendix C for example product.
## Product Information

### everroll® classic, 10 mm

**CE** EN 14041:2004

<table>
<thead>
<tr>
<th>1. Application</th>
<th>Fitness flooring / contract flooring</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Product</td>
<td>Name of Product: everroll® classic (Berlin, Palau, Goa, Manaus, Sidon I, Amsterdam)</td>
</tr>
<tr>
<td></td>
<td>Colour: black with coloured particles</td>
</tr>
<tr>
<td></td>
<td>Material: elastic premanufactured flooring mat made from EPDM granulates and selected rubber granulates bound with polyurethane</td>
</tr>
<tr>
<td></td>
<td>Thickness: 10 mm</td>
</tr>
</tbody>
</table>

| 3. Technical Data | Specific Weight: 1015 kg/m² |
|                  | Weight per m²: 10.15 kg |
|                  | Tensile Strength: 2.40 N/mm² DIN 53 571 Specimen B |
|                  | Elongation at Break: 130% DIN 53 571 Specimen B |
|                  | Tear Resistance: 16.0 N/mm DIN 53 515 |
|                  | Coefficient of Friction: ≥ 0.3 μ EN 14 041 |
|                  | Temperature Resistance: - 40°C up to 115°C |
|                  | Coefficient of friction: DIN EN 13 893 |
|                  | Fire Resistance: DIN EN 13 501-1 |

### Notice

The above mentioned test data are based on periodic laboratory testing of test specimen taken from the actual manufacturing process and show the average values measured. The publishing of these technical data does not relieve the user of the necessity to test the relevant product for physical fitness based on a specific application. As the final use and application of our products are out of our control, this is the sole responsibility of the buyer / end user. All of our products do carry a warranty against manufacturer's defects according to our standard terms and conditions of sale. Due to deviations in raw materials, external influences like temperature and humidity variations, and the fact that this data relates to a resilient material, the above mentioned values are subject to vary up to +/- 25%.

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eMail: info@berleburger.de • Internet: www.berleburger.com
### APPENDIX F - Equipment and Procedure

The following equipment was used during the survey.

The equipment was calibrated before and after the survey and no drift from calibration was found.

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Manufacturer</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound Level Meter</td>
<td>NTi</td>
<td>XL2</td>
</tr>
<tr>
<td>Signal Generator</td>
<td>NTi</td>
<td>MP-PRO</td>
</tr>
<tr>
<td>Calibrator</td>
<td>Norsonic</td>
<td>1251</td>
</tr>
<tr>
<td>Active Loudspeaker on tripod</td>
<td>Mackie</td>
<td>Thump 12</td>
</tr>
</tbody>
</table>
APPENDIX G - Acoustic Feature Corrections

A rating penalty has been established based on a subjective assessment of characteristics. Penalties have been applied based on GSAD’s previous experience of condenser units.

A total rating penalty of 5 dB has been applied.

2 dB penalty for tonality: typical condenser units can have tonal components that are perceptible. Tonal components may or may not be audible at the receptors located at a distance of 75m, however, a small correction has been applied to adopt a cautious approach.

3 dB penalty for intermittency: condenser units turn on / off during operation. On / off states may or may not be perceptible at the receptors located at a distance of 75m, however, a small correction has been applied to adopt a cautious approach.
APPENDIX H – Insul Prediction: Airborne Separation to Residential Dwellings

Sound Insulation Prediction (v8.0.9)

Program copyright Marshall Day Acoustics 2015
- Key No. 2515
Margin of error is generally within Rw +/- 3 dB
Job Name:
Job No.:
Page No.:
Date: 30 Sep 16
Initials: JAMES
File Name: Unit 3 to Residential ATF Ladbroke Grove.xls

System description
Panel 1: 1 x 100.0 mm Concrete Block (p=1880 kg/m3, E=8.3 GPa, n=0.02)
Cavity: None; Stud spacing 600 mm
Panel 2: 1 x 105.0 mm Brick (p=1600 kg/m3, E=8.9 GPa, n=0.02)
Mass-air-mass resonant frequency = 17 Hz

<table>
<thead>
<tr>
<th>frequency (Hz)</th>
<th>R(dB)</th>
<th>R(dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>48</td>
<td>51</td>
</tr>
<tr>
<td>63</td>
<td>52</td>
<td>57</td>
</tr>
<tr>
<td>80</td>
<td>61</td>
<td>64</td>
</tr>
<tr>
<td>100</td>
<td>77</td>
<td>67</td>
</tr>
<tr>
<td>125</td>
<td>85</td>
<td>80</td>
</tr>
<tr>
<td>160</td>
<td>95</td>
<td>89</td>
</tr>
<tr>
<td>200</td>
<td>108</td>
<td>94</td>
</tr>
<tr>
<td>250</td>
<td>122</td>
<td>99</td>
</tr>
<tr>
<td>315</td>
<td>143</td>
<td>106</td>
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<tr>
<td>400</td>
<td>161</td>
<td>110</td>
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<tr>
<td>500</td>
<td>179</td>
<td>120</td>
</tr>
<tr>
<td>630</td>
<td>197</td>
<td>140</td>
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<tr>
<td>800</td>
<td>217</td>
<td>158</td>
</tr>
<tr>
<td>1000</td>
<td>247</td>
<td>177</td>
</tr>
<tr>
<td>1250</td>
<td>277</td>
<td>197</td>
</tr>
</tbody>
</table>

Notes: It was observed that the wall of Unit 3 was comprised of at least one layer of blockwork and one layer of brickwork. It was also observed that the residential dwellings outer envelope was brickwork. A prediction of the acoustic performance of these independent walls has been undertaken in the Insul acoustic prediction software. The following assumptions were made for the prediction in order to airc on the side of caution: blockwork is of the minimum thickness - 100mm; no cavity between blockwork and brick at Unit 3; brick is the minimum thickness of 105mm; air gap with no physical connection between Unit 3 and residential 100mm; single layer brickwork at residential façade, thickness 105mm. The lab based prediction is 81 dB Rw. The likely real world in-situ performance is typically 13 dB below the lab based prediction, giving a predicted performance of approximately 68 dB DnTw + Ctr.
APPENDIX I - Glossary of Acoustic Terms

DECIBEL (dB) - A unit of sound pressure measurement
Sound Pressure Level in dB \( (L_p) = 20 \log (\frac{\text{Measured sound pressure}}{\text{Reference sound pressure}} = 20 \mu Pa) \)

\( dB(A) \) - The A-weighted sound pressure level, the weighting network reduces low frequency sound in a similar way to the human ear.

REVERBERATION TIME (RT or \( T \)) – decay of sound in rooms
The time taken for a sound, once terminated, to fall through 60dB i.e. to one millionth of its original sound intensity. \( T_{30} \) – RT for first 30dB of decay. \( T_{600} \) - Mid frequency RT.

HERTZ (Hz) - a unit of frequency measurement. The normal range of hearing is from 20Hz to about 15kHz.

ABSORPTION COEFFICIENT – degree to which a material absorbs sound.
The ratio of absorbed to incident sound energy (perfect absorber = 1)

SOUND REDUCTION INDEX \( R \) – quantity which describes a material’s ability to reduce the sound pressure level across it (e.g. a wall or floor)

\[ R = L_1 - L_2 + 10 \log (S/A) \]

\( L_1 \) - Average sound pressure level in source room (averaged from 100 Hz – 3150 Hz)
\( L_2 \) - Average sound pressure level in receiving room (averaged from 100 Hz – 3150 Hz)
\( S \) – Wall Area (m\(^2\))
\( A \) – Total absorption in receiving room (m\(^2\) units)

\( Rw \) – weighted sound reduction index

AVERAGE ROOM TO ROOM LEVEL DIFFERENCE – \( D \), dB = \( L_1 - L_2 \), averaged 1/3 octave bands from 100Hz – 3150kHz.

\( Dw \) – weighted value of \( D \) (usually 2 - 3dB higher)

\( DnT, w \) – \( Dw \) corrected for reverberation time of receiving room

NOISE RATING CURVES (NR CURVES) – set of curves used to describe optimum background noise levels for different tasks.

\( L_{10}/90 \) LEVEL (dB) - The level in dB of a time varying sound pressure level (e.g. traffic) exceeded for 10%/90% of the time of measurement.
\( L_{90} \) is usually called the BACKGROUND NOISE LEVEL.

\( L_{eq} \) AVERAGE SOUND PRESSURE LEVEL – level dB of a time varying sound pressure level with equal amounts of energy above and below it, for the time of measurement.

TONAL NOISE – noise of a single frequency (or a narrow band of frequencies that can be perceived as a tone), audible above the broad band noise background. Noise which is at least 5dB above the average of the 1/3 octave band sound pressure levels immediately on either side of it.