Report for

Tibbalds Planning and Urban Design Ltd

Regents Park Estate, Camden

58-60 Hampstead Road – Sound Insulation Assessment

Status: Final **Date: 28.09.2015**

Regents Park Estate, Camden

58-60 Hampstead Road – Sound Insulation Assessment

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Date	28.09.2015
Version Number	A2524/N/005
Status	Final

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1. INTRODUCTION

ACCON UK Limited (ACCON) has been instructed by Tibbalds Planning and Urban Design Ltd to carry out a sound insulation assessment for the existing 58-60 Hampstead Road, Camden.

There is an existing theatre located on the ground floor and the upper floors will be converted into flats as part of the Regents Park Estate regeneration scheme.

In order to ensure that the use of the theatre does not cause a significant adverse noise effect to the future residents of the proposed first floor flat, it is necessary to consider the existing floor construction between the ground and first floors and the level of sound insulation presently provided.

The location of the theatre is identified in **Figure 1.1** below.

Figure 1.1: Site Location

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2. THE NATURE, MEASUREMENT AND EFFECT OF NOISE

Noise is often defined as sound that is undesired by the recipient. Whilst it is impossible to measure nuisance caused by noise directly, it is possible to characterise the loudness of that noise. 'Loudness' is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitudes of the numbers involved, a logarithmic scale of decibels (dB) is normally used, based on a reference level of the lowest audible sound.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequencies to approximate the human response. The resulting 'A' weighted decibel, dB(A), has been shown to correlate closely to the subjective human response.

When related to changes in noise, a change of ten decibels from say 60 dB (A) to 70 dB (A) would represent a doubling in 'loudness'. Similarly, a decrease in noise from 70 dB (A) to 60 dB(A) would represent a halving in 'loudness'. A change of 3 dB (A) is generally considered to be just perceptible. A short glossary of acoustic terms is provided in **Appendix 1**.

The nature of noise levels within the proposed community hall would be dominated by relatively high levels of music across a broad range of frequencies. **Table 2.1** provides examples of typical noise levels.

Table 2.1: Typical Noise Levels

Approximate Noise Level (dB(A))	Example
0	Limit of hearing
30	Rural area at night
40	Library
50	Quiet office
60	Normal conversation at 1 m
70	In car noise without radio
80	Household vacuum cleaner at 1 m
90	Music noise in a bar
105	Music noise in a nightclub

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3. ASSESSMENT CRITERIA

In assessing the potential impact of noise from the theatre on the future occupiers of the first floor flat, it is necessary to consider the acceptability of noise levels which might emanate from the theatre. This section of the report will therefore outline criteria which are considered to be applicable for this type of assessment.

3.1. London Borough of Camden DP28 – Noise and Vibration

LBC's Development Policy 28 (adopted November 2010) gives guidance on noise and vibration within the Camden area and contains criteria, by way of Noise and Vibration Thresholds, which LBC will have regard to when assessing planning applications. The policy is reproduced below.

> ***Policy DP28 - Noise and vibration***
>
> *The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:*
>
> *a) development likely to generate noise pollution; or*
> *b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.*
>
> *Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.*
>
> *The Council will only grant permission for plant or machinery if it can be operated without cause (sic) harm to amenity and does not exceed our noise thresholds.*
>
> *The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact.*

The criteria most relevant to the proposed development are summarised in **Table 3.1** below, however it should be noted that these criteria more accurately relate to activity noise from a nearby building, not from within the same building.

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Table 3.1: Noise levels from places of entertainment on adjoining residential sites at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Sites adjoining places of entertainment
Noise at 1 metre external to a sensitive façade	Day	0700-2300	$L_{Aeq,5m}$ shall not increase by more than 5dB[1]
Noise at 1 metre external to a sensitive façade	Night	2300-0700	$L_{Aeq,5m}$ shall not increase by more than 3dB[1]
Noise inside any living room of any noise sensitive premises, with the windows open or closed	Night	2300-0700	$L_{Aeq,5m}$ (in the 63Hz Octave band measured using the 'fast' time constant) should show no increase in dB[1]

Note: (1) As compared to the same measure, from the same position, and over a comparable period, with no entertainment taking place.

3.2. The Building Regulations Approved Document E "Resistance to the passage of sound"

The requirements under Part E of Schedule 1 to the Building Regulations 2000 are from 1st July 2003 as follows:

"E1. Dwelling houses, flats and rooms for residential purposes shall be designed and constructed in such a way that they provide reasonable resistance to sound from other parts of the same building and from adjoining buildings."

Although not strictly applicable to walls separating theatres and residential dwellings, the standards for "rooms for residential purposes" can be utilised for comparison purposes. The minimum values for airborne and impact sound insulation for "rooms for residential purposes" are outlined in **Table 3.2** below.

Table 3.2: Rooms for Residential Purposes – Performance Standards for Separating Walls, Separating Floors and Stairs that have a Separating Function.

		Airborne Sound Insulation $D_{nT,w} + C_{tr}$ dB (Minimum Values)	Impact Sound Insulation $L'_{nT,w}$ dB (Maximum Values)
Purpose built rooms for residential purposes	Walls	43	-
	Floors and stairs	45	62
Rooms for residential purposes formed by material change of use	Walls	43	-
	Floors and stairs	43	64

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3.3. World Health Organization Guidelines for Community Noise

The World Health Organization (WHO) has developed guidelines designed to minimise the adverse effects of noise. The guidelines relevant to residential noise exposure are detailed in **Table 3.3**. For each specific environment the stated noise levels are the maximum levels to avoid the health effect noted.

Table 3.3 WHO Community Noise Guideline Values

Specific Environment	Critical health effect(s)	L_{Aeq} dB	Time Base (hours)	L_{Amax} (fast) dB
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45

It should be noted that the WHO document recommends that, with respect to the guideline values in **Table 3.3** above, a cautious approach should be taken for noise with a large proportion of low-frequency components.

3.4. British Standard BS 8233

BS 8233: *Sound Insulation and Noise Reduction for Buildings – Code of Practice* has a number of design criteria and limits for intrusive external noise. The guidelines are designed to achieve reasonable resting/sleeping conditions in bedrooms and good listening conditions in other rooms and the most appropriate to the residential environment are reproduced in **Table 3.4**.

Table 3.4: Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 – 23:00	23:00 – 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 $L_{Aeq,8hour}$

BS 8233 states that the noise levels presented in **Table 3.4** relate to “sources without a specific character”. Whilst not strictly applicable to entertainment noise, which could be described as having a “specific character”, the criteria can assist in providing an indication as to the acceptability of noise from this source.

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With regards to internal sound insulation, Section 7.5 of BS 8233 provides a matrix of example sound insulation values. For a source room with “very high” activity noise, and a “sensitive” receiving room, the matrix suggests that a sound insulation value of 57 dB $D_{nT,w}$ is achieved.

Annex H is another section of BS 8233 that provides advice with regards to sound insulation between noisy areas and habitable rooms. Annex H of BS 8233 is an informative section that has a number of example design criteria for hotels, in terms of the level of sound reduction to be provided by internal partitions and to prevent noise from becoming intrusive. The guidelines are designed to achieve reasonable resting/sleeping conditions in bedrooms and, between a bedroom and a restaurant/bar/kitchen area it suggests that a sound insulation value of 60 dB $D_{nT,w}$ is achieved. It is considered by ACCON that this standard of sound insulation could also be applicable to a theatre in order to prevent noise from patrons and from activities from becoming intrusive.

3.5. Assessment Criteria Summary

It is evident by reviewing the assessment criteria that there are no set criteria for noise breaking out from theatres into a residential dwelling within the same building. It is clear that a high standard of sound insulation should be achieved, in order to prevent noise from becoming intrusive.

It is also clear that the low frequency sound insulation performance should be considered to prevent any potential music noise, which could form part of an act at the theatre, from becoming a nuisance to future residential occupants.

In addition to considering airborne noise from the theatre to the future residential dwelling, this assessment will also consider the impact noise from footfall. The purpose of assessing the impact noise is to minimise any disturbance caused by the future residents of the first floor residential property on any performances taking place in the theatre below.

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4. NOISE MEASUREMENT SURVEYS

4.1. Sound Insulation Testing

In order to determine the current level of sound insulation, a noise measurement survey has been undertaken in order to quantify the sound reduction properties of the existing structure.

Noise measurements were carried out on Wednesday 8th July 2015. A Norsonic 118 Sound Level Meter Type 1 Precision Sound Level Meter, with a current certificate of calibration, was utilised to carry out the noise measurements. Before and after the measurement periods the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (+/- 0.5 dB).

4.1.1. Existing Airborne Sound Insulation

Noise measurements were undertaken in line with the procedures detailed in ISO 140-4 *"Field measurements of airborne sound insulation between rooms"*.

Noise was generated utilising a Minirator pink noise generator and amplifier through a dodecahedron speaker. Measurements were obtained in one-third octave frequency bands between 100 Hz and 3150 Hz. The dodecahedron speaker was located in two positions in the theatre. Spatially averaged internal noise measurements were made in both the theatre and the room immediately above the theatre on the first floor.

The results of the measurements are given in **Table 4.1** below:

Table 4.1: Airborne Sound Insulation Results

Source Room	Volume (m^3)	Receiver Room	Volume (m^3)	$D_{nT,w} + C_{tr}$ (dB)	$D_{nT,w}$ (dB)
Theatre	311	First Floor Room	160	38	46

Table 4.2 below provides a summary of the noise reduction offered by the floor and compares the sound insulation values against the requirements of the Building Regulations Approved Document E (ADE) and BS 8233 respectively.

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Table 4.2: Airborne Sound Insulation Summary

Source Room	Receiver Room	$D_{nT,w} + C_{tr}$ (dB)	Meets ADE Criteria (43 dB $D_{nT,w} + C_{tr}$)	$D_{nT,w}$ (dB)	Meets BS8233 Section 7 Criteria (57 dB $D_{nT,w}$)	Meets BS8233 Annex H Criteria (60 dB $D_{nT,w}$)
Theatre	First Floor Room	38	No	46	No	No

It can be seen, with respect to **Table 4.2**, that the existing floor between the theatre and first floor room fails to achieve the ADE and BS 8233 performance requirements for airborne noise.

4.1.2. Existing Impact Sound Insulation

The impact sound insulation performance of a 'floor' is assessed by placing a tapping machine on the floor in the source room whilst the noise levels are measured in the receiving room. The tapping machine comprises five hammers arranged along a common driven rail. The hammers are raised and allowed to fall freely from a height of 40mm. The time between impacts is 100ms and the mass of each hammer is 500g. Standardising the measured data to a reference reverberation time, the floor standardised impact sound pressure level (L'_{nT}) can then be calculated. This is then compared with a reference curve such that the weighted standardised impact sound pressure level can be obtained ($L'_{nT,,w}$). It should be noted that the tapping machine was placed at 45° to the joists.

Measurements were obtained in one-third octave frequency bands between 100 Hz and 3150 Hz. The tapping machine was located in four positions in the existing first floor room (source room) and spatially averaged internal noise measurements were made within the theatre (receiver room) directly below. **Table 4.3** provides a summary of the noise reduction offered by the floor and compares the sound insulation value against the requirements of ADE.

Table 4.3: Impact Sound Insulation Summary

Source Room	Volume (m^3)	Receiver Room	Volume (m^3)	$L'_{nT,w}$ (dB)	Meets ADE Maximum Performance (64 dB)
First Floor Room	160	Theatre	311	63	Yes

It can be seen from **Table 4.3**, that the existing floor achieves the requirements of ADE for impact noise. It should be noted, however, that the theatre regards the current noise level from impact noise (such as footfall) as intrusive. Therefore, in order to prevent future

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footfall becoming disturbing during performances, a significant improvement over the requirements of ADE should be achieved.

4.2. Activity Noise

In order to predict the noise levels within the proposed first floor dwelling, ACCON have undertaken noise measurements during a play at the theatre. It should be noted that the theatre staff have advised that this was not the loudest performance that can occur at the theatre. The measured noise levels, therefore, should be taken as an indication of a "typical" play and not as the highest possible noise levels generated within the theatre.

Noise measurements were carried out on Friday 10th July 2015 simultaneously within the theatre and within the first floor room immediately above the theatre. The noise measurements were carried out utilising two sound level meters: a Svantek 971 and a Bruel & Kjaer 2250, which both have current certificates of calibration. Field calibration of the equipment was undertaken before and after the measurements to ensure that the measurement system remained within acceptable limits of calibration (+/- 0.5 dB) and no significant drift was noted.

The measured noise levels are presented in **Table 4.4** below. The noise measurements utilised are for the five minute period during the play which generated the highest level of noise. This five minute period included a high proportion of music noise played through the existing PA system.

Table 4.4: Measured Noise Levels During a Typical Play

Measurement Location	$L_{eq,5min}$ (dB) in Frequency (Hz)							$L_{Aeq,5min}$ (dB)
	63	125	250	500	1k	2k	4k	
Ground Floor Theatre	88.7	84.7	77.5	82.8	84.0	79.3	69.8	86.9
First Floor Room[1]	66.0	64.0	49.3	44.7	58.8	57.8	41.5	62.1
Level Difference, D	**22.7**	**20.7**	**28.2**	**38.2**	**25.2**	**21.5**	**28.3**	**24.7**

Note: (1) The measured noise level on the first floor could potentially include extraneous noise sources such as road traffic noise.

A graphical representation of the measured noise levels in the first floor room immediately before and during the performance, as well as the measured noise levels within the theatre during the performance, is presented in **Figure 4.1** below.

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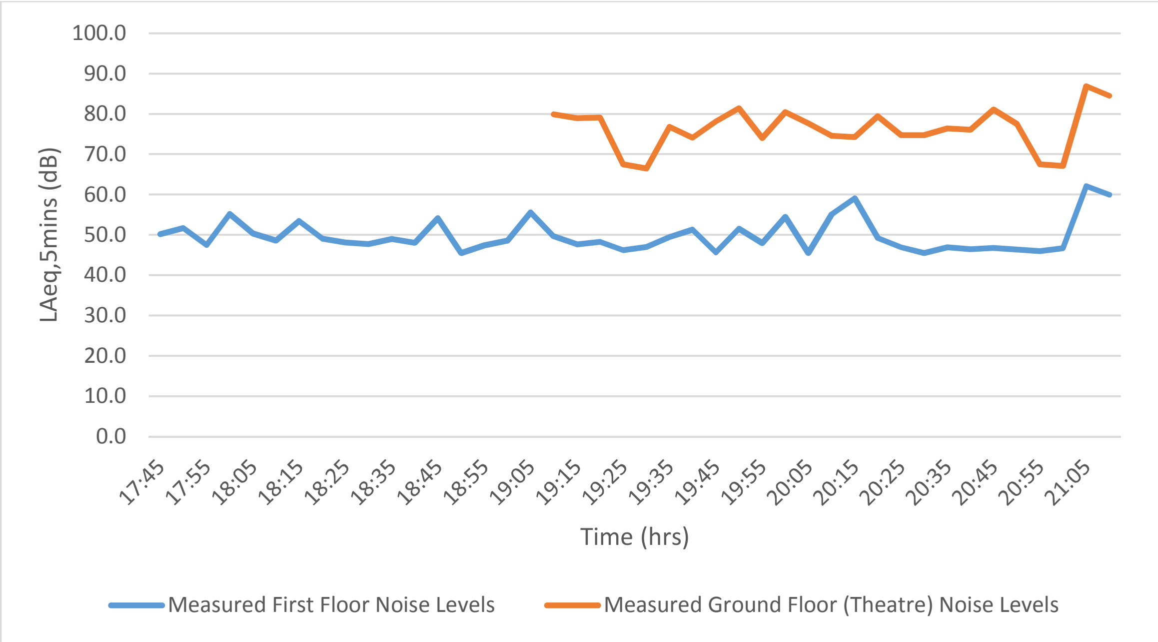
Figure 4.1: Comparison of Measured Ground Floor and First Floor Noise Levels



It can be seen, by reference to **Figure 4.1**, that the measured noise level on the first floor does not change significantly for the time period before the play started and during the performance, which is due to the influence of road traffic noise. ACCON understand that the window units on the upper levels of the building will be replaced as part of the renovation project, which will reduce the level of road traffic noise within the proposed flat.

Figure 4.1 also demonstrates that, when there is music noise in the theatre, which there was only towards the end of the play in this instance, the noise level on the first floor increases significantly in line with the noise level in the theatre. As other plays and performances may include additional music noise elements, this demonstrates that it is important that the sound insulation of the floor is substantially improved such that the potential noise impact on future residents on the first floor is minimised.

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5. SOUND INSULATION ASSESSMENT

5.1. Existing Floor

The existing floor consists of 200mm floor joists with one layer of 'ceiling board' attached directly to the joists below. The exact type of 'ceiling board' is unknown, ACCON have assumed that it is one layer of 15mm 'Fireline' plasterboard based on the available information. Above the joists is a floating floor of unknown construction that has a depth of 100mm. Based on the available information, ACCON have assumed that the floating floor is constructed of 15mm hard wood floorboards placed directly on 100mm bearers.

The sound insulation properties of the existing floor construction have been calculated using the computer software INSUL.

The INSUL programme has calculated that the existing floor construction provides an R_w (laboratory airborne sound insulation rating) of 50 dB and C_{tr} of -7 dB, which matches the results of the Sound Insulation Testing. The $L_{n,w}$ (laboratory impact sound insulation rating) has been calculated to be 64 dB.

5.2. Proposed Floor

In order to achieve the required improvement in sound insulation, the existing floor should be upgraded to provide greater separation between the floor and ceiling elements to the joists and also to increase the mass of the floor. Increasing the mass of the floor will significantly improve the low frequency sound insulation. In order to achieve the highest of the recommended sound insulation values in BS 8233, which is a $D_{nT,w}$ of 60 dB, an R_w of 67 dB is required.

The ceiling should be removed from the joists and re-mounted on resilient bars. The resilient bars would be attached to the 200mm floor joists. Two layers of 15mm soundblocking plasterboard (minimum density 840 kg/m^3) should be added to the ceiling in addition to the existing ceiling board so that there are three layers of plasterboard in total. There should be at least 50mm of mineral wool type sound insulation (minimum density 10 kg/m^3) placed between the joists.

On top of the joists there should be one layer of 5mm thick mass loaded vinyl (MLV) and one layer of 22mm thick flooring particle board. Care should be taken during installation not to pierce the MLV as this will affect the sound insulation properties (the low frequency sound insulation is significantly improved by the addition of the MLV).

A floating floor should be installed on top of the particle board, which should consist of 50mm joists placed in a rubber isolation clip, which should be installed strictly according to the manufacturer's instructions. A further layer of 22mm thick flooring particle board should be placed on top of the 50mm joists. 50mm of mineral wool type sound insulation (minimum density 10 kg/m^3) should be placed in the floor void.

It is important to note that, as with any construction project, the ability to meet specification will rely upon the quality of the built structure. As it is difficult to remedy any defects at a

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later stage it is also important to consider any potential flanking paths or bridging of the isolation to ensure that these do not undermine the effectiveness of the sound insulation package.

An initial review of the proposed floor construction has confirmed that it would be feasible to accommodate the sound insulation measures.

The sound insulation properties of the proposed floor construction have been calculated using the computer software INSUL.

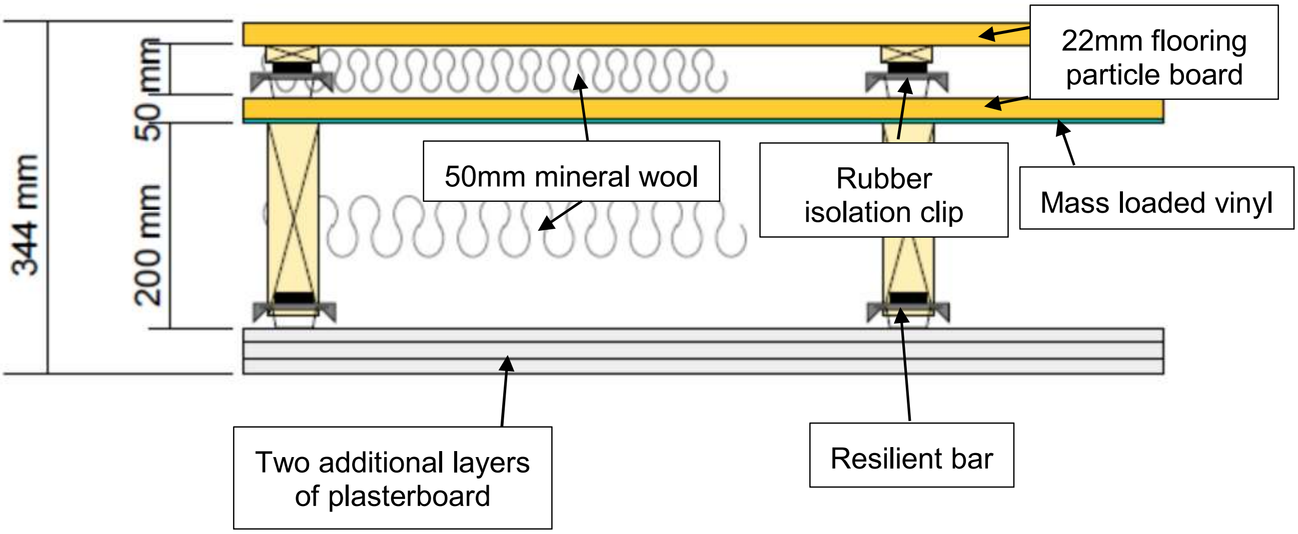
The INSUL programme has calculated that the proposed floor construction provides an R_w (laboratory airborne sound insulation rating) of 67 dB and C_{tr} of -5 dB. The $L_{n,w}$ (laboratory impact sound insulation rating) has been calculated to be 49 dB. The predicted airborne and impact sound insulation of the proposed floor demonstrate that a significant improvement over the sound insulation of the existing floor can be achieved.

The predicted airborne sound insulation in octave bands is shown in **Table 5.1** and a sketch of the proposed floor is shown in **Figure 5.1**.

Table 5.1: Predicted Airborne Sound Insulation

	R_w (dB) in Frequency (Hz)							R_w (dB)
	63	125	250	500	1k	2k	4k	
Proposed Floor	32	51	60	66	66	66	72	67

Figure 5.1: Proposed Floor



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6. NOISE IMPACT ASSESSMENT

6.1. Octave Band Analysis

In order to determine the noise impact of the use of the theatre on the proposed residential flat above, a comparison to determine the likely increase in noise levels has been carried out. The comparison has been carried out in line with the general requirements of LBC in terms of noise increases, as detailed in **Section 3.1**. The assessment is shown in **Table 6.1** below.

The activity noise level on the first floor, which is shown in **Table 6.1**, has been calculated using the formula:

$$SPL2 = SPL1 + 10\log\left(\frac{S}{A}\right) - SRI$$

Where: SPL2 = the sound pressure level within the living rooms;
SPL1 = the sound pressure level within the hall from live music;
SRI = the SRI of the floor;
S = the area of the floor in m^2; and
A = the absorption area of the living room in m^2.

Table 6.1: Predicted Activity Noise Level on First Floor

	Frequency (Hz)							Total 'A' Weighted
	63	125	250	500	1k	2k	4k	
Existing Ambient, $L_{eq,5min}$[1]	62	55	46	42	40	36	30	45
Measured Activity Noise Level in Theatre, $L_{eq,5min}$[2]	89	85	78	83	84	79	70	87
Airborne Sound Insulation (R)	32	51	60	66	66	66	72	-
Predicted Activity Noise Level on First Floor, $L_{eq,5min}$	57	34	17	17	18	13	0	20
Cumulative Noise Level, $L_{eq,5min}$	63	55	46	42	40	36	30	45
Difference between Existing and Cumulative Noise Levels	1	0	0	0	0	0	0	0

Notes: (1) The existing ambient noise level is the lowest measured 5 minute period noise level within the first floor flat in the hour before the performance (1800hrs-1900hrs).
(2) This is the highest measured noise level during the play, and is due to amplified music noise through the existing PA system.

It can be seen, by reference to **Table 6.1**, that the predicted noise levels will not increase the ambient noise level during the evening time period within the proposed flat, except at

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63 Hz and that increase would be imperceptible. As the highest measured activity noise levels have been utilised, general activity noise would therefore not raise the ambient noise level and would be likely to be imperceptible.

It should be noted, however, that if there are any events that finish later in the evening, and in particular after 2300hrs, then the ambient noise levels would be likely to have reduced. There may therefore be a greater noise impact during the later evening period and after 2300hrs than is indicated in **Table 6.1**. ACCON understand, through liaison with the theatre, that it is rare for events to go on after 2300hrs but that it does happen on occasion. It would therefore be recommended that, once the renovation work is completed and the sound insulation of the floor has been improved, that a commissioning test is carried out in order to determine what the maximum music noise level should be in the theatre at night such that there are no significant noise impacts in the flat above. Further guidance is provided in **Sections 7.1** and **7.2** regarding additional measures that can be implemented that would assist in reducing any noise impacts.

6.2. BS 8233 and WHO Guidelines – Internal Noise Levels

Table 6.1 above identifies the predicted noise level within the flat.

The predicted noise level from music within the theatre within the proposed first floor flat is 20 dBA. This is significantly below the daytime and night-time noise criteria set out in BS 8233 and the WHO guidelines of 35 dBA and 30 dBA respectively.

It should be noted that whilst general compliance with the BS 8233 and the WHO Guidelines is achieved, the guidance does suggest that a cautious approach should be adopted where there is a large proportion of low frequency noise content, such as may occur from amplified music.

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7. ADDITIONAL CONSIDERATIONS

7.1. Anti-Vibration Mounts

The speakers for the existing PA system are mounted directly to the wall of the theatre. In order to prevent vibration transferring directly into the wall and into the flat above, and therefore undermining the sound insulation of the floor, it is recommended that appropriate anti-vibration mounts are installed.

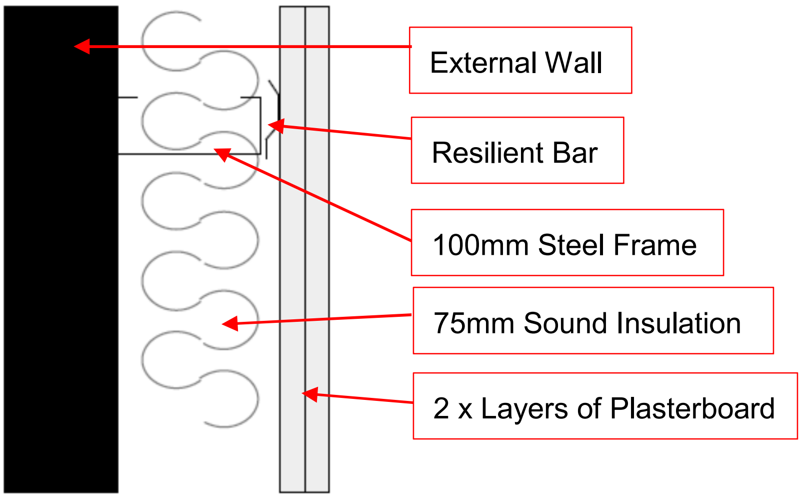
Additionally, there is an existing air conditioning unit within the theatre, which is mounted directly to the ceiling. Appropriate anti-vibration mounts should be installed to prevent the direct transfer of vibration into the ceiling and floor.

7.2. Independent Wall Lining

In order to prevent flanking noise from undermining the effect of the proposed sound insulation of the floor/ceiling, it is recommended that an independent wall lining is installed within the first floor flat. The wall lining would be required to be installed on all walls that surround the theatre and extend up to first floor, such as the external walls.

The wall lining should consist of two layers of 15mm soundblocking plasterboard (minimum density 840 kg/m^3) mounted on a 100mm steel frame. The plasterboard should be mounted on resilient bars. Alternatively, the steel frame could be mounted independently from the external wall. There should be at least 75mm of mineral wool type or rigid sound insulation (minimum density 10 kg/m^3) placed within the steel frame, as demonstrated in **Figure 7.1**.

Figure 7.1: Independent Wall Lining



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7.3. Structural Integrity and Lighting Rail

The structural integrity of the floor and ceiling structure should be considered by an appropriately qualified structural engineer to ensure that the recommendations of this report can be implemented in full without damaging the floor structure.

Additionally, the weight of the lighting rail should be considered to ensure that it can be hung from the proposed ceiling (like the existing rail), or whether it would need to be hung independently from the walls.

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8. CONCLUSIONS

A sound insulation assessment has been carried out in relation to the floor between the Camden People's Theatre and the proposed first floor flat at 58-60 Hampstead Road.

A detailed noise measurement study of the sound insulation of the floor has taken place, along with noise measurements taken during a typical play at the theatre. It is not considered likely that the theatre would wish to have music noise louder than the highest measured noise levels during the play for a significant period of time as that would quickly become uncomfortable for staff and patrons.

An alternative floor construction, detailed in **Figure 5.1**, has been recommended that is expected to achieve the highest recommendation in BS 8233 for a similar building use and would significantly improve both the airborne and impact sound insulation of the floor. An initial review of the proposed floor construction has confirmed that it would be feasible to accommodate the sound insulation measures. The addition of independent wall linings within the first floor flat, as detailed in **Figure 7.1**, would assist in preventing flanking noise from undermining the sound insulation of the floor/ceiling construction.

Additionally, consideration of anti-vibration mounts for speakers and the air-conditioning unit within the theatre would assist in preventing any significant adverse noise impacts on future occupants of the proposed first floor flat.

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Appendix 1
Glossary of Acoustic Terms

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Appendix 1: Glossary of Terms

Term	Description
'A'-Weighting	This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.
Decibel (dB)	This is a tenth (deci) of a bel. The decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.
Frequency	Frequency is related to sound pitch; frequency equals the ratio between velocity of sound and wavelength.
$L_{Aeq,T}$	The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.
L_{Amax}	The 'A'-weighted maximum sound pressure level measured over a measurement period.
R_w	Weighted sound reduction index, a single number quantity for the airborne sound insulation in buildings and of building elements such as wall, doors and windows. The quantity is intended for rating the airborne sound insulation and for simplifying the formulation of acoustical requirements in building codes, when measured in the presence of flanking sound transmission, denoted R'_w.
D	Arithmetic difference of the SPL between two spaces, for example room (a) and room (b)
D_w	Single number quantity describing arithmetic difference in SPL between room (a) and room (b) in buildings and of building elements such as walls, doors and windows, when measured in the presence of flanking sound transmission, denoted D'_w.
$D_{nT,w}$	Weighted value of D, standardised to a constant reverberation time.
C_{tr}	The correction to a sound insulation quantity (such as $D_{nT,w}$) to take account of a specific sound spectra.
$D_{nT,w} + C_{tr}$	A single number quantity which characterises the airborne sound insulation between rooms using noise spectra No.2 as defined in BS EN ISO 717-1:1997

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