Noise Intrusion Testing

Block C - 111 Dudden Hill, London

Stroma Built Environment Ltd.

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Revision History

Revision	Date	Description	
4v1	23/03/2021	First Issue	
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1. Introduction

1.1 Stroma Built Environment has been appointed by Mendick Waring Ltd (the Client) to undertake an internal noise survey within the newly built residential apartment blocks located at 111 Dudden Hill, London. The purpose of the survey and subsequent report is to demonstrate compliance with the requirements of Planning Condition 4 of Brent Council's Decision Notice reference 16/4010 dated 25th July 2017. The relevant condition is reproduced below:

> 4 All residential premises shall be designed in accordance with BS8233:2014 'Guidance on sound insulation and noise reduction for buildings' to attain the following internal noise levels:
>
> | Time | Area | Maximum noise level |
> |---|---|---|
> | Daytime Noise 07:00 – 23:00 | Living rooms and bedrooms | 35 dB LAeq (16hr) |
> | Night time noise 23:00 – 07:00 | Bedrooms | 30 dB LAeq (8hr) |
>
> Tests shall be carried out prior to first occupation of any phase within one room of each built facade type for a living and bedroom area over a four-day period, to show that the required internal noise levels have been met and the results submitted to the Local Planning Authority for approval in writing.
>
> Reason: To obtain required sound insulation and prevent noise nuisance.

1.2 A consultation was undertaken with Brent Council prior to undertaking internal noise monitoring. An email was submitted setting out the proposed testing strategy, and Stroma received a response from Ketan Joshi, Nuisance Control Officer, confirming acceptance. The email is provided in Appendix II.

1.3 This report set out the results of noise monitoring undertaken in Block C only. Monitoring within block A as per the agreed schedule will be reported separately.

1.4 At the time of the noise survey the UK was subject to restrictions due to the COVID-19 pandemic. General activities and traffic levels have increased since the initial lockdown period and are generally considered to be representative of typical levels, however there are still restrictions in place limiting large gatherings, travel and events.

1.5 Data available from the Department of Transport (DfE)[1] suggests that traffic levels during the early part of March 2021 were around 76% of typical levels. This reduction in traffic levels would likely correspond to an approximate 1 dB reduction in road traffic noise.

[1] https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic

2. External Noise Intrusion

2.1 In order to assess the level of noise intrusion within dwellings, long term noise measurements have been undertaken within a single apartment located in Block C, to include weekday and weekend periods.

2.2 Measurements were undertaken in both the bedroom and living area within what was considered to be the worst-case apartment within Block C, at second floor level, as highlighted in Figure 1 below. A full site plan is available in Appendix I.

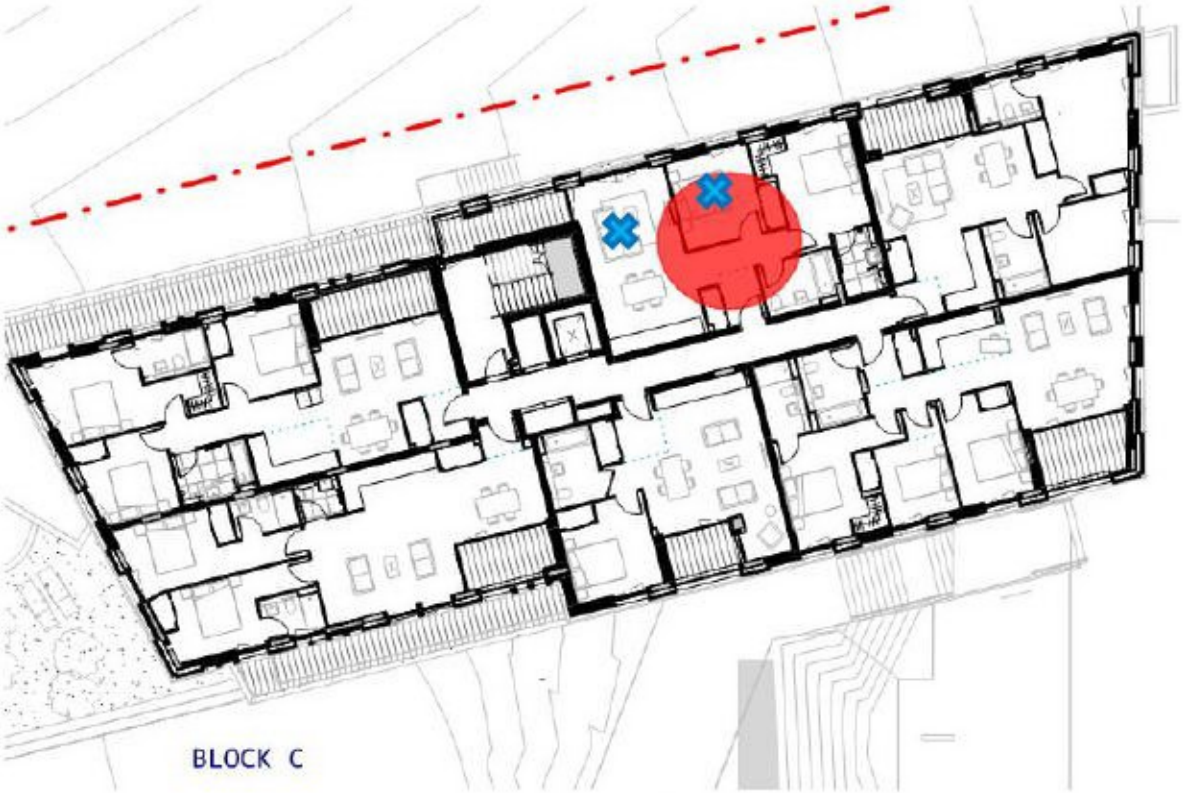


Figure 1. Second floor apartment used in Block C, with the measurement positions marked with a cross

2.3 Noise measurements were recorded continuously throughout and include audio recordings to allow for identification of individual events. It is considered the measurements taken would be representative of the living rooms and bedrooms on each elevation and that the window specification is the same.

2.4 Measurements were undertaken using four NTI XL2 Class 1 sound level meters. The sound level meters were mounted on tripods, at a height of approximately 1.5m above floor level. Measurement positions were at least 1.5 m from any windows and 1 m from any walls.

2.5 Measurements were taken following good practice guidance set on in Acoustics and Noise Consultants (ANC) document '*Measurement of Sound Levels in Buildings v1.0 June 2020*'

2.6 All windows and doors within the dwelling in Block C were closed at the time of testing. All apartments in the development are understood to be mechanically ventilated with no requirement for façade ventilators or open windows to provide ventilation in accordance with Approved Document F to the building regulations. Mechanical ventilation systems were not operational during the measurement period.

2.7 The rooms tested were completed having glazing and wall and ceiling finishes in place, however the rooms were unfurnished. It is anticipated that the reverberation time within the room would decrease once the room is fully furnished, which would reasonably be expected to reduce noise levels by approximately 1-2 dB. The measurements presented below have not been corrected for reverberation.

2.8 Measurements were conducted during the ongoing construction phase of the development, therefore any data recorded between 07:30 and 17:15 on weekdays and 07:30 and 13:15 on Saturday to exclude any influence from construction noise. The audio recordings of the construction periods have been reviewed and any obvious periods where construction activities cease have been included in the analysis. These periods are indicated in the tables below.

2.9 Tables 1 – 3 below present a summary of the measured noise levels.

2.10 Full data sets of the measurements are available on request.

Summary of Measured Noise Levels

Table 1: Block C Bedroom - Daytime

Start Date and Time	Measurement Duration Daytime (hrs)	Measured L_{Aeq} (dB)	Condition 4 requirements	Compliant with Planning Condition 4 requirements
11/03/2021 17:15	5:45:00	27	≤ 35 dB $L_{Aeq,16\ hours}$	YES
12/03/2021 07:00	6:15:00	26		YES
13/03/2021 07:00	10:30:00	27		YES
14/03/2021 07:00	16:00:00	25		YES
15/03/2021 07:00	06:15:00	27		YES

Table 2: Block C Bedroom – Night-time

Start Date and Time	Measurement Duration Night-time (hrs)	Measured L_{Aeq} (dB)	Condition 4 requirements	Compliant with Planning Condition 4 requirements
11/03/2021 23:00	8:00:00	23	≤ 30 dB $L_{Aeq,8\ hours}$	YES
12/03/2021 23:00	8:00:00	24		YES
13/03/2021 23:00	8:00:00	23		YES
14/03/2021 23:00	8:00:00	24		YES
15/03/2021 23:00	8:00:00	25		YES

Table 3: Block C Living Area - Daytime

Start Date and Time	Measurement Duration Daytime (hrs)	Measured L_{Aeq} (dB)	Condition 4 requirements	Compliant with Planning Condition 4 requirements
11/03/2021 17:15	5:45:00	30	≤ 35 dB $L_{Aeq,16\ hours}$	YES
12/03/2021 07:00	6:15:00	28		YES
13/03/2021 07:00	10:30:00	32		YES
14/03/2021 07:00	16:00:00	28		YES
15/03/2021 07:00	6:15:00	30		YES

3. Conclusion

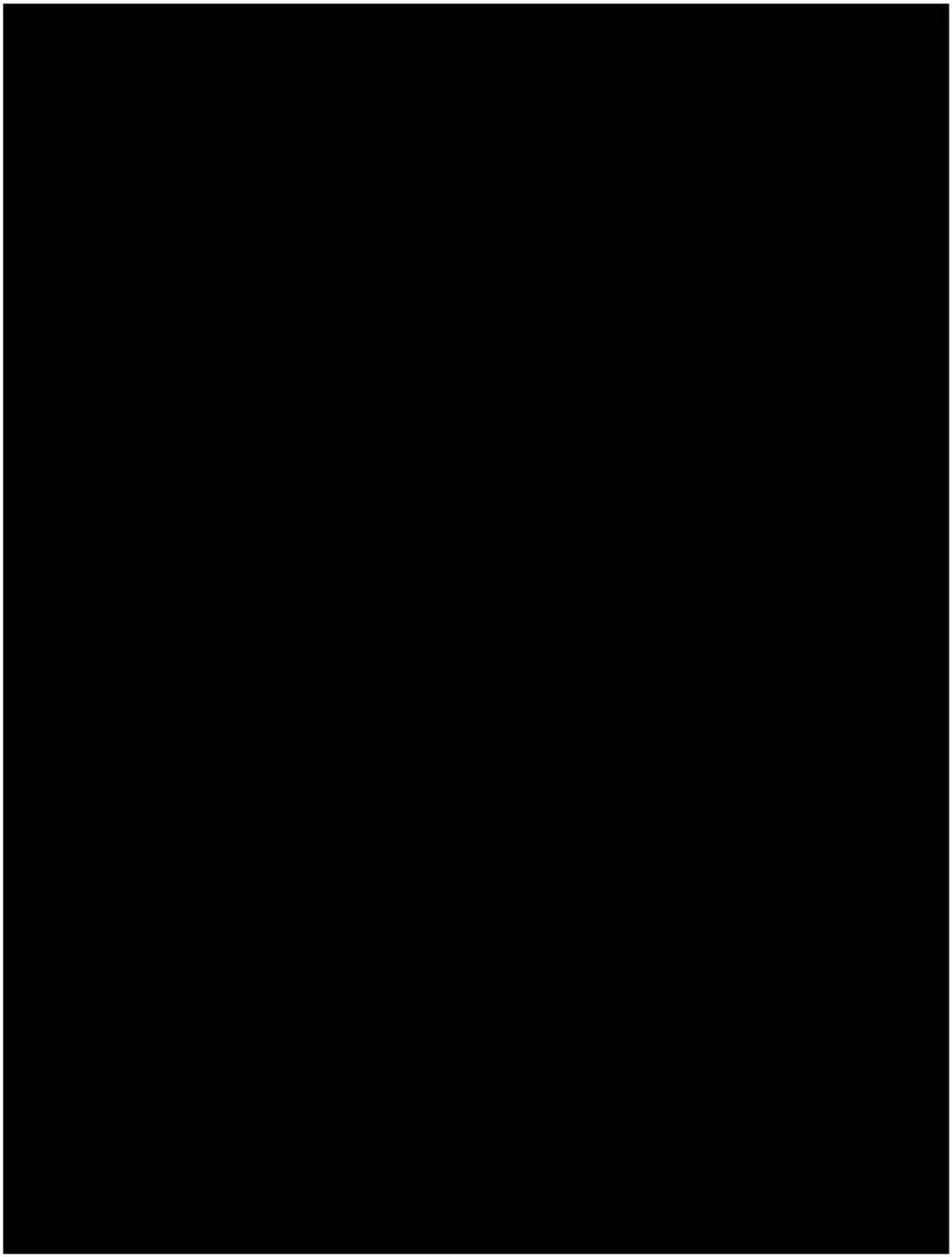
3.1 Stroma Built Environment conducted a programme of noise intrusion testing for a new residential development at 111 Dudden Hill, London.

3.2 The purpose of the noise intrusion testing is to demonstrate compliance with the internal noise criteria defined in Planning Condition 4, outlined in the Brent Council Decision Notice, reference: 16/4010 dated 25th July 2017.

3.3 A noise survey has been undertaken within a representative Bedroom and Living Room in Block C to assess levels of external noise intrusion over the course of a representative weekday and weekend periods. It should be noted that due to construction work taking place, noise levels for a full 16-hour daytime period on weekdays could not be reported. Instead, a reduced period was used so to exclude any influence from construction noise.

3.4 The measured noise levels indicate that the requirements of Planning Condition 4 for both the day and night time periods can be satisfied within the dwelling in Block C.

Appendix I. Site Plans



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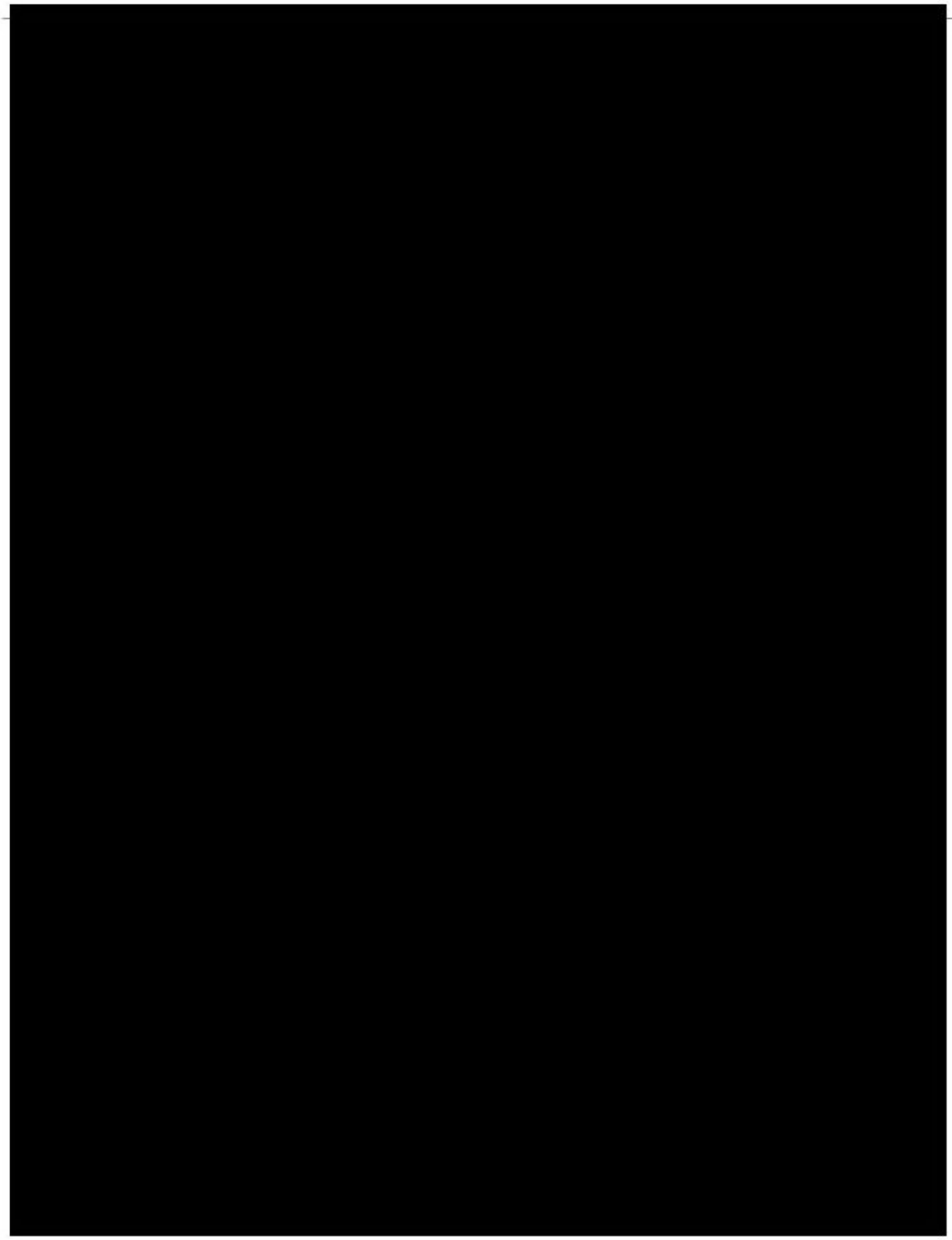

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Appendix III. Acoustic Glossary

Sound pressure level and the decibel, dB

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. The decibel is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

Frequency and hertz, Hz

Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz. The human range of hearing is commonly accepted to be 20 Hz to 20,000 Hz. Additionally, an octave can be used to describe the interval between a frequency in Hz and either half or double that frequency.

Frequency weighting

Different weighting networks can be applied to a given sound level in each stated octave band by a specified amount, in order to better represent the response of the human ear. The most commonly used weighting network is the 'A' weighting, and the letter 'A' will be included within a descriptor to indicate that the value has been 'A' weighted, e.g. $L_{Aeq,T}$ or L_{A90}. An 'A' weighted noise level may also be written as dB(A). Other weightings less commonly used are 'C' and 'D' weighting.

Noise indices

When a noise level varies with time, the measured 'A' weighted dB level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple 'A' weighted dB value. In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The various indices used are described as below:

$L_{Aeq,T}$	The 'A' weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period, T
L_{Amax}	The maximum 'A' weighted noise level that was recorded during the monitoring period.
L_{A10}	The 'A' weighted noise level that was recorded for at least 10% of the monitoring period.
L_{A90}	The 'A' weighted noise level that was recorded for at least 90% of the monitoring period, usually taken as the underlying 'background' noise level.

Sound level difference, *D*

The sound level difference between two internal spaces, or between internal and external spaces. The '*D*' value is used to denote the differences at each third octave or octave band, with a single figure 'weighted' value to describe an overall performance. Note that the '*D*' value will always describe an in-situ or on-site acoustic performance. All values are described using the decibel.

D_w	Single figure weighted sound level difference, simply the measured source noise level minus receiver noise level, not adjusted to reference conditions
$D_{nT,w}$	Weighted normalised sound level difference – a single, weighted sound insulation value, normalised to a reference reverberation time using the measured reverberation time in the receive room
$D_{nT,w} + C_{tr}$	As above, with a spectral adaptation term applied to account for the effects of low frequency noise, and based on urban traffic noise
$D_{nf,w}$	Overall flanking normalised level difference - A parameter that defines the flanking transmission of sound from room to room where a dividing partition or floor construction abuts a flanking building element common to both rooms, such as the building façade or ceiling

Sound reduction index, *R*

This describes the sound transmitted through a material or building element, such as a wall, door, or window. It is measured in a laboratory with suppressed flanking transmission. The '*R*' value is used to denote the differences at each third octave or octave band, with a single figure 'weighted' value to describe an overall performance. All values are described using the decibel.

R_w	Weighted single figure sound reduction index
$R_w + C_{tr}$	As above, with a spectral adaptation term applied to account for the effects of low frequency noise, and based on urban traffic noise
R'_w	The 'apparent sound reduction index', a field measurement to obtain the sound reduction index of a material or element, with all effects of site installation accepted.

Standardised impact sound pressure level, $L'_{nT,w}$

$L'_{nT,w}$ is the single figure used to characterise the impact sound pressure level in a receiving room, normalised to a reference reverberation time. Impact noise can be classified as (but is not limited to) the result of footfall impact on a separating floor to a habitable space below. All values are described using the decibel.

Reverberation time, *T* and T_{mf}

The reverberation time of a space is a measure of the rate at which sound decays, measured in seconds. It is defined as the time taken for the sound pressure level to reduce by 60 dB from its original impulse level. Reverberation time is commonly quoted in terms of the mid-frequency reverberation time, T_{mf}, the arithmetic average of the reverberation times in the 500 Hz, 1 kHz, and 2 kHz octave bands.

Absorption Coefficient

The acoustic absorption provided by a surface is defined as the sound absorption coefficient α, which denotes the fraction of sound energy absorbed between 0 (no absorption) and 1 (no reflection). The absorption coefficient of a material varies with the frequency of incident sound waves, therefore is considered for different frequencies.

Absorption Class

Based on the absorption coefficients, the overall sound absorption of a material is classified from Class A to Class E as defined in BS EN ISO 11654:1997, with Class A providing the highest level of acoustic absorption.

Noise rating, NR

The noise rating or NR system is commonly used in the design of noise emitted by internal building services systems. The system is frequency dependent, and was empirically derived to prevent disturbance to occupants in habitable or working areas from building services noise that exhibits 'tonal' elements, e.g. rumbles, whines, whistles etc. There is no direct relationship between the average 'A' weighted noise level in dB and the NR. However, as a guide, and assuming the absence of strong low frequency content in a given noise, the NR could generally be said to be 6 dB less than the average 'A' weighted dB value.

Privacy

Privacy is the addition of the level of sound insulation between two rooms and the background noise within a receiving room. It can be used to assess the level of privacy afforded in the 'receiving room' for speech from the 'source room'. The 'privacy factor' is a unit-less value that is the combination of the average 'A' weighted background noise level in dB and the weighted sound level difference (D_w) in dB.

Appendix IV. Report Conditions

This document has been prepared for the sole use, benefit and information of the Client. The liability of Stroma Built Environment Ltd. in respect of the information contained herein will not extend to any third party unless prior agreement is obtained in writing from Stroma Built Environment Ltd.

This report is limited to addressing the specific acoustic issues contained herein. Advice has been provided for acoustic reasons only and it is recommended that appropriate expert advice be sought on all the ramifications, e.g. safety, fire, structural, CDM etc., associated with any proposals contained herein.

The in-situ performance of acoustic measures is influenced to a large extent by the quality of workmanship and compliance with the specifications on-site during construction, as such, Stroma Built Environment Ltd. accepts no liability for issues with acoustic performance arising from such factors.

Acoustic survey and testing work carried out for the project is representative of the prevailing conditions at the time of the work. Conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

In particular, it should be noted that where calculations are carried out that are based on assumptions regarding certain aspects where information has not been supplied, these are provided for indicative purposes only and should be treated as such.