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Indoor Tennis Court Refurbishment

The Northern Lawn Tennis Club, Palatine Road

14 September 2026

19951-NIA-01-AA-R3

Noise Impact Assessment

Project Number
19951

Issued For
The Northern Lawn Tennis Club

Institute of Acoustics sponsoring organisation
CQMS Safety Scheme
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CHAS Contractors Health & Safety Assessment Scheme Accredited Contractor
Constructionline
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EXECUTIVE SUMMARY

This noise impact assessment has been undertaken in order to assess proposed refurbishment works to an existing indoor tennis court building at The Northern Lawn Tennis Club, Palatine Road, Manchester M20 3YA, to facilitate continued use of the building in its current use.

The description of the proposed development is as follows:

> *"Refurbishment works to the existing indoor tennis court building at Northern Lawn Tennis Club, including removal of the existing asbestos roof and replacement; replacement and alteration of rooflights; bricking up of selected windows; installation of new black louvred ventilation windows, replacement doors and mechanical ventilation system; removal of external fire escape stairs; upgrading of roof drainage; replacement of existing louvres and retained doors in black; and associated repairs and refurbishment to structural and external elements."*

A noise impact assessment has been undertaken with consideration to the following:

- Noise breakout of tennis court activities through the upgraded façade elements of the retained building
- Determination of suitable criteria for plant noise emissions, relating to the proposed mechanical ventilation

A background noise survey has been undertaken as detailed in the report, in order to determine an appropriate design target for noise emissions, in accordance with typical Local Authority planning requirements.

Tennis court noise emissions have been assessed primarily according to the guidance of Sport England document 'Artificial Grass Pitches (AGP) Acoustics – Planning Implications'. Plant noise criteria have been established primarily according to the guidance of British Standard 4142: 2014 +A1: 2019 '*Methods for rating and assessing industrial and commercial sound*' and Local Authority requirements.

Calculations of tennis court noise breakout were undertaken using the proprietary noise modelling software package CadnaA for the nearest identified receivers. It should be noted that if there are closer receivers than those assessed in this report, a reassessment will be necessary, and this should therefore be confirmed by the Client.

It has been demonstrated that compliance with the established criterion for tennis court noise is expected, dependent on the courts being used during daytime hours (07:00 to 23:00) only and guidance being followed in terms of an acoustic performance for passive ventilation louvres and noise management measures.

It should be ensured that plant noise emission criteria are considered as mechanical plant designs progress through later stages of the project.

If there is any deviation from the above, Clement Acoustics must be informed, in order to establish whether a reassessment is necessary.

Clement Acoustics has used all reasonable skill and professional judgement when preparing this report. The report relies on the information as provided to us at the time of writing and the assumptions as made in our assessment.

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REVISION HISTORY

Issue	Date of Issue	Author
R3	14/09/2026	[redacted] **Duncan Martin** Director BSc (Hons) MIOA

Issue	Comment
R0	First Issue
R1	Amended to consider latest proposals to retain existing building and use
R2	Minor amendments to descriptions and references
R3	Updated to reflect removal of roof cowl proposals

1.0 INTRODUCTION

Clement Acoustics has been commissioned by The Northern Lawn Tennis Club to undertake an assessment of anticipated noise emissions associated with the proposed Indoor Tennis Court Refurbishment at The Northern Lawn Tennis Club, Palatine Road, Manchester, M20 3YA.

Relevant standards and good practice documents have been used alongside previously measured residual noise levels to determine noise emissions criteria for continued tennis court use in the retained and refurbished building, and associated external plant in agreement with typical Local Authority planning requirements.

This report presents the established criteria followed by noise impact calculations for the tennis court use and outlines any necessary mitigation measures.

An acoustic terminology glossary is provided in Appendix A.

2.0 SITE DESCRIPTION

The development area has been derived from drawing 2025-34-MRH-203 Rev D, issued in June 2026 by MRH Design and comprises the existing building, which is to be retained, and the immediate surrounding areas and access routes.

The existing building position is shown in Figure 2.1, highlighted yellow.



Figure 2.1 Site plan indicating building layout

The wider site location and surroundings is shown in attached site plan 19951-SP1.

The description of the proposed development is as follows:

> *"Refurbishment works to the existing indoor tennis court building at Northern Lawn Tennis Club, including removal of the existing asbestos roof and replacement; replacement and alteration of rooflights; bricking up of selected windows; installation of new black louvred ventilation windows, replacement doors and mechanical ventilation system; removal of external fire escape stairs; upgrading of roof drainage; replacement of existing louvres and retained doors in black; and associated repairs and refurbishment to structural and external elements."*

Works relevant to the acoustic assessment are works to replace the roof of the building, installation of a mechanical ventilation system, and minor works including removal of windows (to be removed, blocked up and made good) and upgrades to existing passive ventilation louvres.

The proposed mechanical ventilation unit will be installed internally within the building envelope, with ducts to atmospheric terminations on the southeast elevation.

The surrounding area is predominantly residential in nature, with the exception of the existing areas of the tennis club, which include clay, grass and all-weather tennis courts and outdoor padel courts. Residential dwellings have been identified on Elm Road, Parkfield Road South and Blackburn Gardens surrounding the development site. Assessed receivers are described in detail in Section 6.3.

The nearest noise sensitive receivers were identified through observations on-site and a review of available online information including satellite imagery and council tax records. If there are any receivers closer to that identified within this report then a further assessment will need to be carried out.

3.0 ENVIRONMENTAL NOISE SURVEY

In order to provide an understanding of the existing residual noise levels on and around the site, unattended noise surveys were undertaken, as described in the subsequent sections.

Although the survey data is 5 years old, it is noted that any notable development in the area is limited to the recent installation of outdoor padel courts on The Northern site. No significant development has been undertaken relating to other noise sources, including any local roads or tramlines. As such, using the data that was measured prior to any onsite development taking place is considered to be particularly onerous and will result in robust criteria for noise emissions being implemented.

3.1 Onsite Unattended Noise Survey Procedure

Measurements were undertaken at one position close to a residential boundary to the existing tennis club, as shown on indicative site drawing 19951-SP1. The choice of the position was based both on accessibility and on collecting representative noise data in relation to the site and surrounding areas.

The microphone was mounted on a chain-link fence of existing tennis courts close to a residential boundary to the southeast of the tennis club. The microphone was positioned away from vertical reflective surfaces.

The monitoring position was considered to be free-field according to guidance found in BS 4142: 2014, and a correction for reflections has therefore not been applied.

Continuous automated monitoring was undertaken for the duration of the survey between 14:00 on 27 May 2021 and 09:30 on 01 June 2021.

The measurement procedure generally complied with ISO 1996-2: 2017: '*Description, measurement and assessment of environmental noise'*.

3.2 Weather Conditions

At the time of the installation and collection of the unattended survey equipment, the weather conditions were sunny and dry with minimal wind. It is understood that during the unattended survey, weather conditions were generally dry with low wind speeds.

It is considered that the weather conditions were suitable for the measurement of environmental noise.

3.3 Equipment

The equipment calibration was verified, by means of a field verification check, before and after use and no abnormalities were observed.

The equipment used was as summarised in Table 3.1.

Position	Instrument	Manufacturer	Type
UN1	Class 1 sound level meter[1]	Svantek	957
All	Class 1 sound level meter calibrator[1]	Norsonic	Nor1251

Table 3.1 Instrumentation used during the survey

Note [1]: Calibration certificates available upon request

4.0 RESULTS

4.1 Unattended Noise Survey Results

The $L_{Aeq:\ 5min}$, $L_{Amax:\ 5min}$, $L_{A10:\ 5min}$ and $L_{A90:\ 5min}$ acoustic parameters were measured at the location shown in site drawing 19951-SP1, with measured noise levels shown as a time history in Attachment 19951-TH1.

It should be noted that the guidance of the latest revision of British Standard 4142: 2014 +A1 2019 *'Methods for rating and assessing industrial and commercial sound'*, as detailed in Section 8.1 of the standard is as follows:

> *'The objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.'*

Therefore, the typical background noise level will be used for the purpose of this assessment. Average ambient and typical background noise levels summarised in Table 4.1.

Position	Time Period	Average ambient noise level $L_{Aeq:\ T}$, dB	Typical background noise level $L_{A90:\ 5min}$, dB
UN1	Daytime (07:00 - 23:00)	53	40
	Night-time (23:00 - 07:00)	43	34

Table 4.1 Average ambient and typical background noise levels

5.0 NOISE CRITERIA

5.1 Applicable Criteria for Tennis Court Noise

5.1.1 British Standard 4142

British Standard 4142:2014 +A1:2019 '*Methods for rating and assessing industrial and commercial sound*' (BS 4142) is typically used to provide an assessment of proposed commercial activities and their impact on residential receptors.

BS 4142 is also typically the preferred method of assessing commercial and industrial noise.

However, Paragraph 1.3 of BS 4142 lists a number of activities that the standard should not be applied to. This list includes 'recreational activities'. BS 4142 therefore cannot be applied to the assessment of tennis court noise, and alternative guidance has therefore been sought.

5.1.2 Artificial Grass Pitches (AGP)

Sports pitches will be assessed according to the recommendations of Sport England document 'Artificial Grass Pitches (AGP) Acoustics – Planning Implications'.

This document gives recommended methodologies for calculating the noise level due to AGP use at different receivers.

Although the tennis courts may not use artificial grass, the guidance of this document is considered the most relevant applicable to a proposed noise source of sports activity. The sports mentioned in the document are Football, Rugby and Hockey, sports which all include ball impacts, particularly Hockey.

The guidance of the document with regards to setting a noise limit for noise emissions is as follows:

> *"The determining noise criteria for AGPs proximity to residential properties, to avoid moderate annoyance in the daytime and evenings, as set by the World Health Organisation's 'Guidelines for Community Noise': 50 dB $L_{Aeq(1hour)}$ upper noise limit external to residential properties and within external living areas."*

5.1.3 British Standard 8233

BS 8233: 2014: '*Guidance on sound insulation and noise reduction for buildings*' (BS 8233) describes recommended acceptable internal noise levels for residential spaces during daytime and night-time hours. These levels are shown in Table 5.1.

Activity	Location	Design range $L_{eq,T}$	
		Daytime (07:00-23:00)	Night-time (23:00-07:00)
Resting	Living Room	35 dB(A)	-
Dining	Dining Room/Area	40 dB(A)	-
Sleeping	Bedroom	35 dB(A)	30 dB(A)

Table 5.1 BS 8233 recommended internal background noise levels

The guidance of BS 8233, with regards to external amenity spaces, is as follows:

> *"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.*
>
> *However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs*

can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

5.1.4 Adopted Criteria

With loudest external levels of 50 dB(A) at the nearest residential façade, as recommended by APG guidance, acceptable internal conditions as stated in BS 8233 would be met by taking the attenuation of the facade itself into consideration; according to BS 8233, a typical building facade with a partially open window offers 15 dB attenuation, resulting in an internal level of 35 dB(A).

As this is comparable to the AGP guidance of 50 dB(A), this will also be adopted as the criterion to be achieved at residential facades during daytime hours.

The guidance of BS 8233 for external amenity space is also comparable to that of APG, as such we would recommend the lower guideline value of $L_{Aeq,T}$ 50 dB(A) would be an appropriate target to achieve in outdoor garden areas during daytime hours.

In order to provide additional protection to existing residential amenity, the calculated noise emission levels will also be compared with the ambient noise levels shown in Table 4.1.

5.2 Applicable Criteria for Plant Noise

5.2.1 Typical Local Authority Requirements

A planning condition that has been previously applied to a similar proposal for external commercial plant is as follows:

"… any externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location."

The above requirement will be applied to this development. With the building and associated plant expected to be in use during daytime hours only, the resulting criterion for noise emissions based on the measured background noise level shown in Table 4.1 is **L_{Aeq} 35 dB**.

6.0 ASSESSMENT OF TENNIS COURT NOISE

6.1 Source Noise

Attended noise measurements of tennis games were undertaken on outdoor tennis courts at The Northern Lawn Tennis Club, to provide an understanding of the prevailing noise environment. The choice of these positions was based both on accessibility and on collecting representative noise data in relation to the identified significant noise sources.

Three two-minute measurements were undertaken for the duration of the survey between 13:30 on and 14:15 on 27 May 2021.

At the time of the measurements, the ambient noise profile was largely dominated by noise due to activities taking place on the tennis courts.

The noise levels measured at the monitoring position were considered suitably representative of noise from the tennis courts only, being away from any railway lines and surrounding roads.

The sound level meters were mounted approximately 1.5 m above ground level under free-field conditions, approximately 3.5 m from the tennis court baseline with doubles and singles matches occurring on adjacent courts.

A two-minute measurement of concurrent tennis matches on adjacent courts provided a source noise level of L_{Aeq} 53 dB(A) at 3.5 m from the edge of the court.

Measured spectral levels are shown in Table 6.1.

Noise Source	Sound Pressure Level (at 3.5 m from court perimeter, dB) in each Frequency Band, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Tennis Courts	53	47	45	42	51	43	41	34	53

Table 6.1 Measured tennis court noise levels

The noise level shown in Table 6.1 is assumed to be generated by two tennis courts, with calculations assuming a cumulative assessment with all 4 smaller 'red' tennis courts simultaneously in use (i.e. double the level of tennis activity as that measured.

The source noise has been used to calculate a predicted reverberant sound pressure level inside the building using standard acoustic formulae.

It should be noted that the calculated reverberant sound pressure level assumes a reverberation time of 2.0 seconds, which is classed as providing suitable internal conditions for a new-build sports hall

according to the guidance of Building Bulletin 93 'Acoustic design of schools'. As activities in the tennis courts could include coaching, following the guidance of this standard is considered appropriate.

The calculated reverberant sound pressure level in the retained tennis court building with all four tennis courts operational is as shown in Table 6.2.

Noise Source	Reverberant Sound Pressure Level (at 4 m from court perimeter, dB) in each Frequency Band, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Reverberant Sound Pressure Level	69	63	61	58	67	59	57	50	69

Table 6.2 Calculated reverberant sound pressure level in retained building

6.2 Proposed Building Amendments

As the retained tennis courts are indoors, the sound reduction offered by the building facades and roof must also be considered.

Proposed works comprise the following amendments to the existing external building fabric:

- Replacement of existing roof with new roof type: KS1000 RW roof panels
- Removal of existing windows, to be replaced with brickwork matching the existing surrounding walls
- Replacement of existing passive ventilation louvres (see Section 6.2.1)

Drawing 2025-34-MRH-200 '*Proposed – Elevations and Sections*' by MRH Design indicates proposed build ups for external wall and roof elements, including passive ventilation elements, following the upgrade works.

Based on provided information, the predicted sound reduction for each external building element is summarised in Table 6.3.

Element	Data Source	Octave band centre frequency SRI, dB					
		125	250	500	1k	2k	4k
External Walls – Brick[1]	Library data for single leaf brickwork	36	37	32	40	48	55
External Doors	Library data for solid core door	22	25	29	25	26	28
Ventilation Louvres	*See Section 6.2.1*						
Roof – KS1000 RW Roof Panels	Manufacturer literature	18	20	24	20	29	39
Replacement Rooflights	Library data for nominal single glazing	19	22	29	33	29	31

Table 6.3 Summary of predicted sound reduction for external building fabric elements

[1] Assumed to be single leaf brick with no internal lining

For each façade, the composite sound reduction has been calculated based on the existing and proposed elements. The elements on each façade are summarised as follows:

- Northwest Elevation
  - Main wall: Brick (existing)
  - Other elements:
    - Single leaf fire door (existing)
    - Main entrance (new doors replacing existing)[1]
    - Upgraded ventilation louvres[2]
- Northeast Elevation:
  - Main wall: Brick (existing)
  - Other elements:
    - Upgraded ventilation louvres[2]
- Southeast Elevation
  - Main wall: Brick (existing)
  - Other elements:
    - Single leaf fire door (existing)
    - Upgraded ventilation louvres[2]
- Southwest Elevation:
  - Main wall: Brick (existing, with former windows blocked up to match)
  - Other elements:
    - Replacement entrance point doors[3]
- Roof:
  - KS1000 RW Roof Panels[3]
  - New Rooflights[3]

[1] The main entrance doors are protected by a lobby area and intermediate viewing area. Certain management measures are proposed for entrance doors, as shown in Section 6.6.

[2] See recommendations for louvres as shown in Section 6.2.1.

[3] Ensure new elements are selected to provide performance meeting at least the corresponding values shown in Table 6.3

6.2.1 Guidance for Louvres

The replacement of existing natural ventilation louvres with new presents an opportunity to demonstrate a betterment in the acoustic performance of the upgraded building compared with the existing. It is there recommended that louvres with a suitable acoustic performance are used.

We would recommend ensuring all natural ventilation louvres are selected to have a sound reduction performance of at least the values shown in Table 6.4. It should be noted that the performance should be achieved with louvres in the 'open' position.

Element	Octave band centre frequency SRI, dB					
	125	250	500	1k	2k	4k
Passive inlet and exhaust louvres	6	8	10	14	18	16

Table 6.4 Recommended minimum sound reduction performance of louvres

6.3 Receiver Locations

The closest affected residential dwellings have been identified as shown on Figure 6.1.

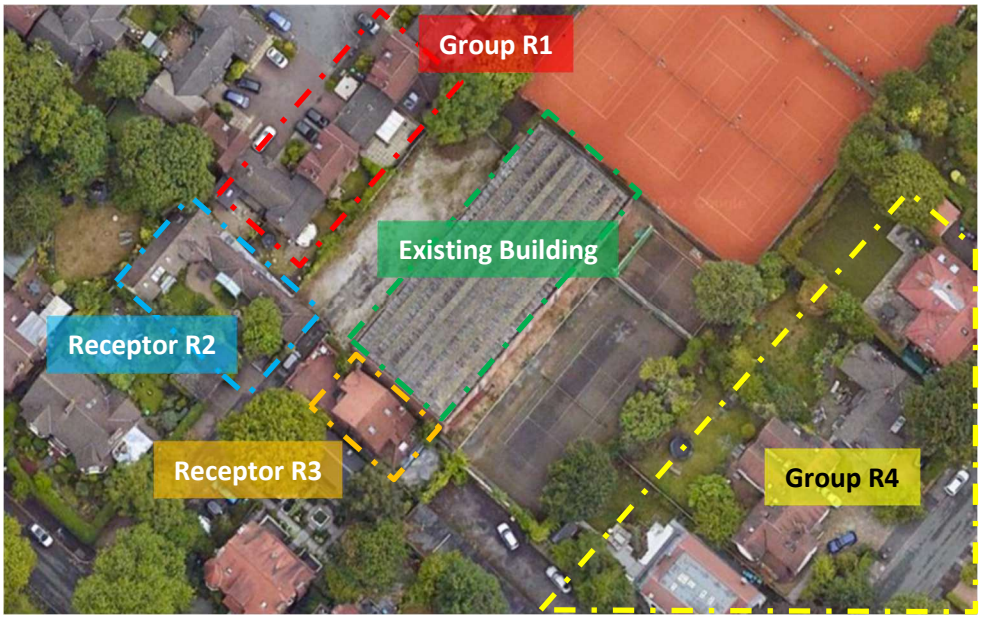


Figure 6.1 Plan view indicating assessed receivers – Image from Google Earth

For each group/receptor, receivers have been placed at the following positions:

- Receiver Facades (Receivers R1a, R2a, R3a and R4a):
  - Building evaluation tool used to calculate highest noise level at any point on façade,
  - Receivers placed at heights representative of ground, first and second floor windows.
- Receiver Garden (Receivers R1b, R2b, R3b and R4b):
  - In the closest point of the garden to the tennis courts,
  - Receivers placed at a height of 1.5 m, to be representative of a typical garden receiver.

6.4 3-Dimensional Noise Model

In order to assess the noise impact of the retained courts, noise emissions have been assessed by developing a noise map.

The noise model was constructed using the proprietary noise modelling software package CadnaA. The noise model was constructed utilising the following assumptions and parameters:

- Noise sources modelled as follows:
  - Building facades: vertical area sources
  - Building roof: area sources
- Noise level for each source calculated according to:
  - Internal reverberant sound pressure level described in Section 6.1
  - Composite sound reduction for each surface as described in Section 6.2

- Façade Assessment:
  - Receivers placed at a height of 1.5 m, 4 m and 6.5 m.
- Garden Assessment:
  - Receivers placed at a height of 1.5 m.
- Hardness of the ground between the sources and receivers has been modelled as reflective around the courts, and absorptive in garden area.

It should be noted that all calculations in the CadnaA model, including those for distance and screening of intermediate building envelopes are undertaken according to International Standard ISO 9613-2:1996 '*Acoustics – Attenuation of sound during propagation outdoors. Part 2: General method of calculation*'. This standard is the preferred method stated in BS 4142 to minimise uncertainty.

The predicted noise levels at receivers have been derived by the use of the 3D noise map model following the calculation method stated in ISO 9613. Calculations are performed over single octave band from 63 Hz to 8 kHz.

6.5 Noise Impact Assessment

Receiver levels have been interrogated from the constructed noise model. Noise propagation towards the façade and garden receivers in plan view is shown in Figure 6.2.

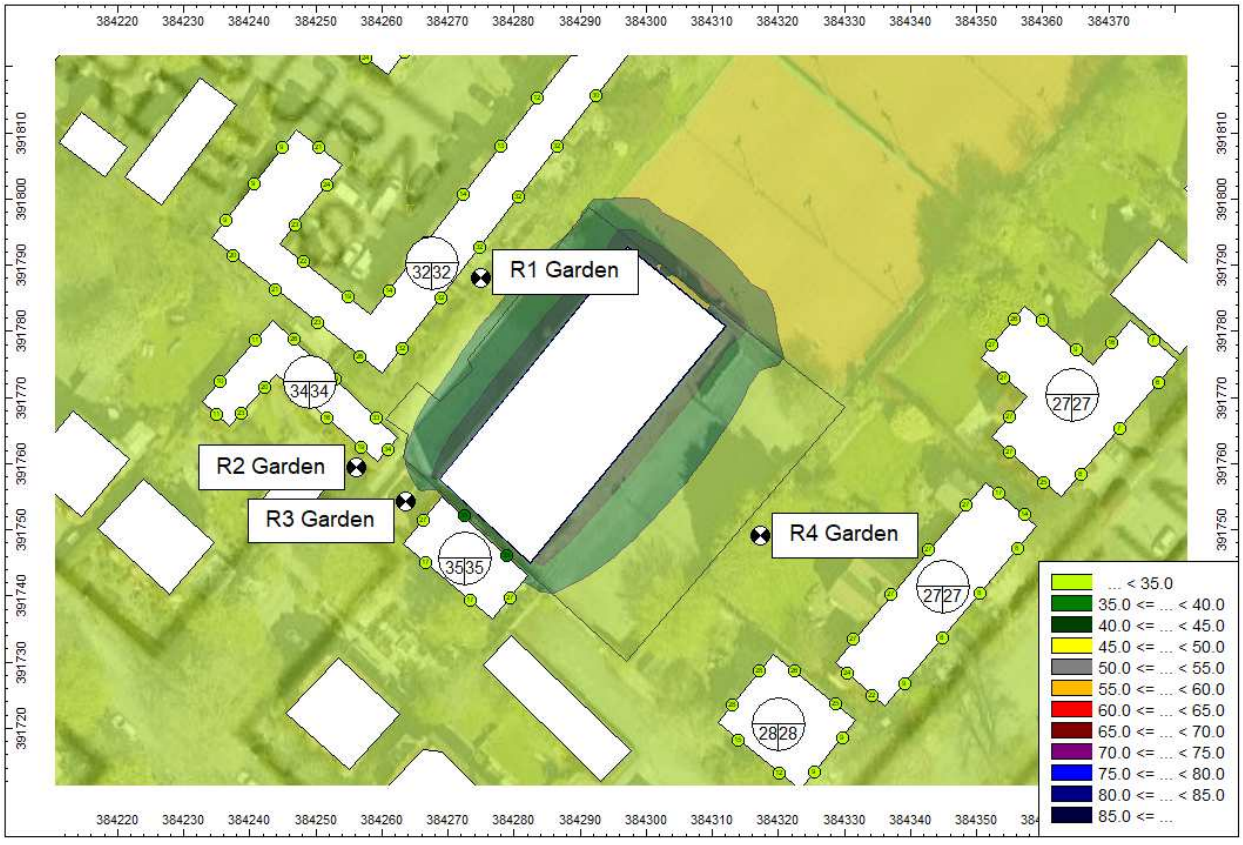


Figure 6.2 Plan view of noise propagation towards receivers – tennis courts

The interrogated noise levels are shown in Table 6.5, where they are compared with the established criterion.

Receiver	Design Criterion	Noise Level at Receiver (due to continued activities)
R1a - Facade	$L_{Aeq,T}$ 50 dB(A)	32 dB(A)
R1b - Garden		32 dB(A)
R2a - Facade		34 dB(A)
R2b - Garden		27 dB(A)
R3a - Facade		35 dB(A)
R3b - Garden		32 dB(A)
R4a - Facade		28 dB(A)
R4b - Garden		30 dB(A)

Table 6.5 Noise levels and project criterion at noise sensitive receivers – tennis court noise

As shown in Table 6.5, the retained and improved external façade elements, in combination with existing attenuation features such as distance are expected to sufficiently reduce noise emissions from the building during daytime hours such that compliance with the established criterion is expected.

Comparing with the existing ambient noise level of 53 dB(A) also indicates that noise from the tennis courts would be more than 15 dB below the existing residual ambient noise level and therefore would not present a dominant source compared with existing sources of noise.

The proposal to replace existing ventilation louvres with new, acoustic equivalents is expected to present a betterment when compared with the building as existing.

6.6 Noise Management Measures

Certain noise management measures are proposed to reduce the level of noise generated. It is noted that the majority of measures already form part of the proposals.

Measures that are recommended to minimise the impacts of noise are as follows:

- The tennis courts should not be in use outside daytime hours (07:00 to 23:00).
- Mechanical ventilation plant should be designed such that the criteria stated in Section 5.2.1 are not exceeded
- The plant installation should not be operational when the courts are not in use.
- The main entrance door should be kept closed when not in use.
- Fire doors in the external walls should be kept closed, except during an emergency.

7.0 CONCLUSION

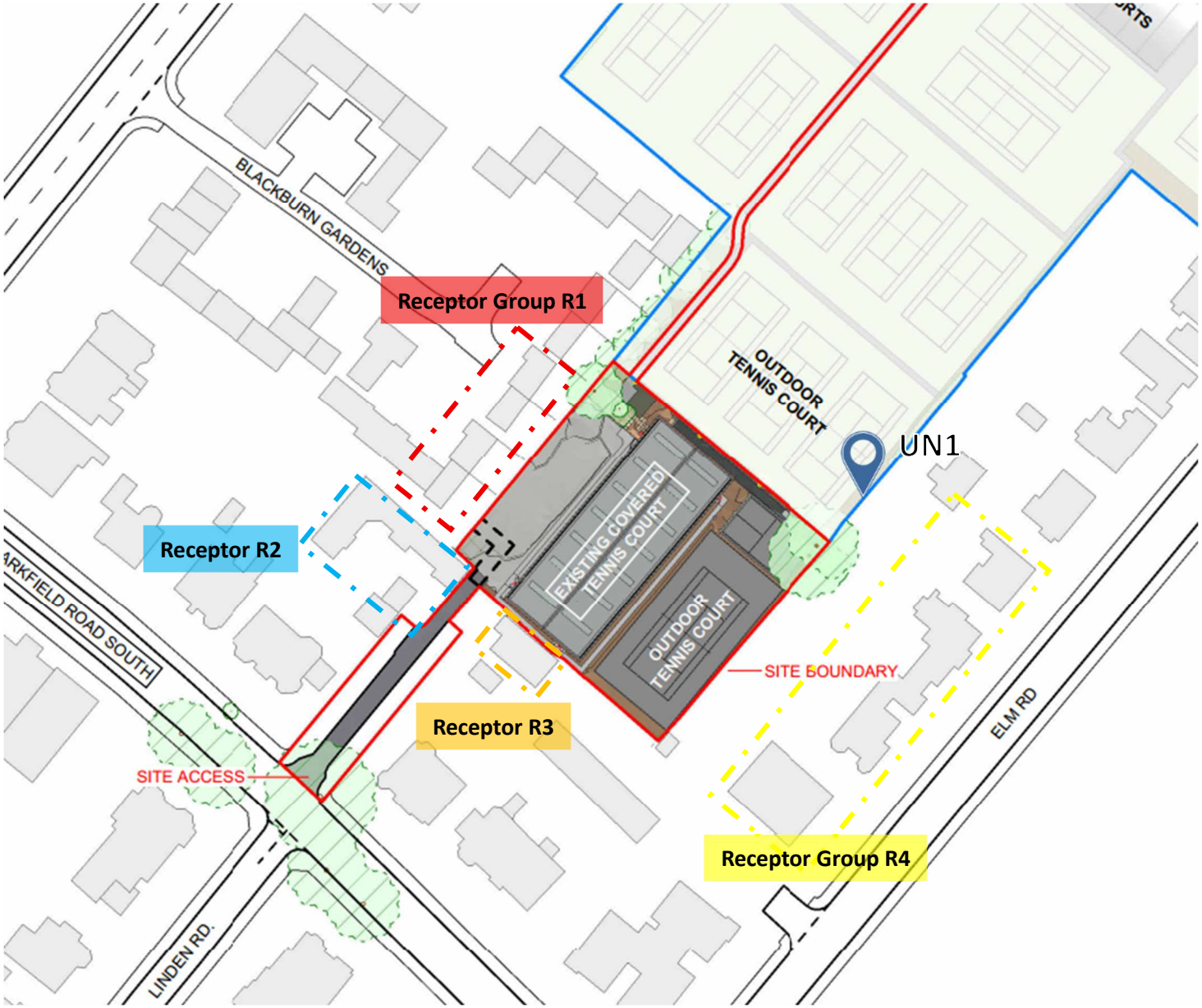
An assessment of environmental noise emissions has been undertaken for the proposed Indoor Tennis Court Refurbishment, at The Northern Lawn Tennis Club, Palatine Road, Manchester, M20 3YA.

Criteria have been set for noise emissions arising from the continued use of indoor tennis courts and an associated plant installation, based on the set requirements of relevant guidance documents and standards.

A noise impact assessment has then been undertaken using previously measured noise data and detailed of proposed building façade upgrades to predict the noise levels, due to the continued use of the courts, at nearby noise sensitive receivers.

Calculations according to the guidance from the relevant documents indicate that façade and garden noise levels are expected to comply with relevant criteria with ventilation louvres selected to match acoustic specifications and a restriction in operating hours to daytime (07:00 to 23:00) use only.

Noise criteria for the proposed plant installation have been derived, and should be considered when designing the mechanical ventilation system.



N

Not to scale

Description:
Indicative site plan showing noise monitoring position and nearest sensitive receivers

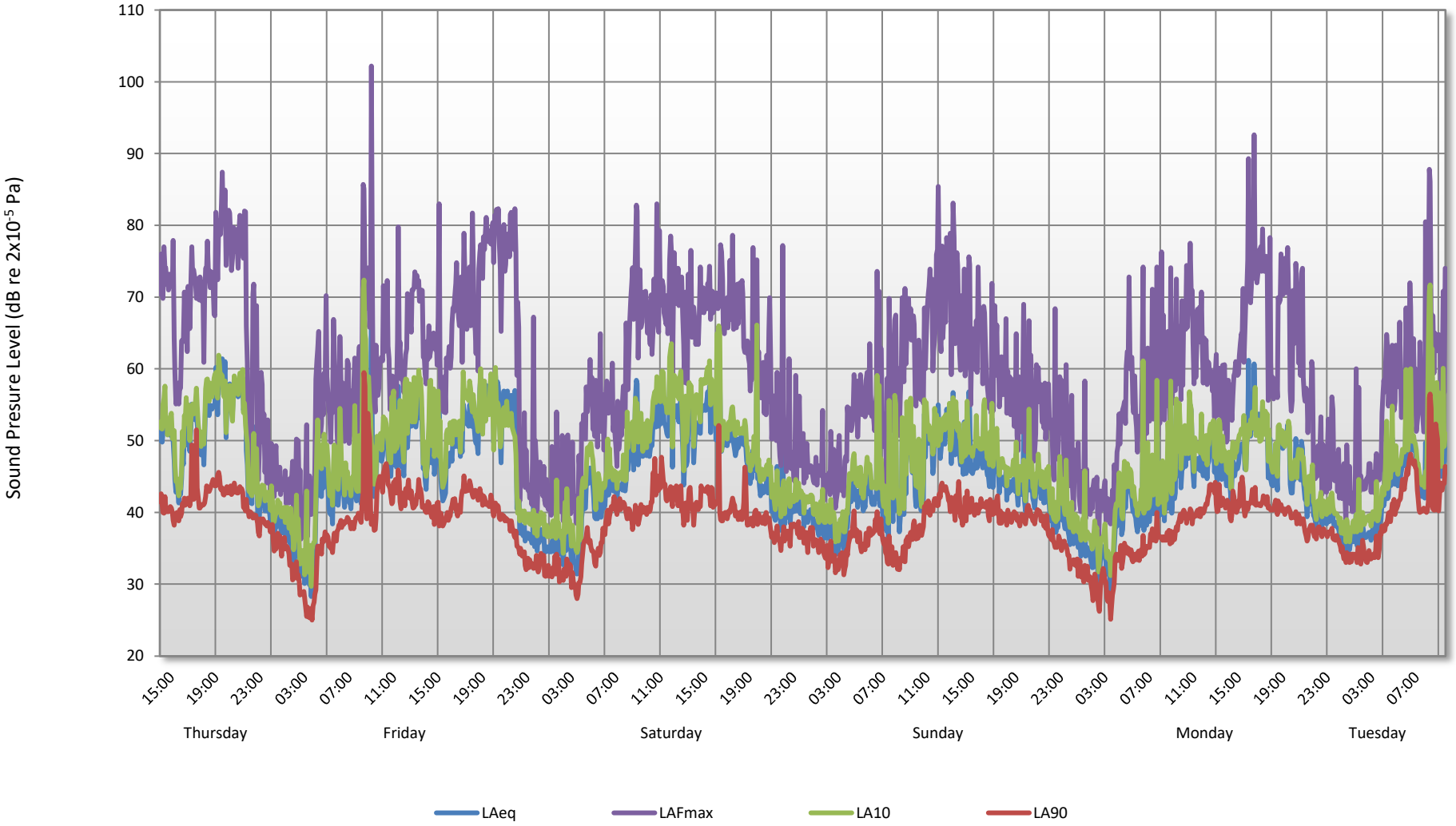
Date	14 September 2026
Reference	19951-SP1 R3
Project Name	Indoor Tennis Court Refurbishment
Image ©	MRH Design

Key:	
	Unattended Noise Survey Position

Proposed Indoor Padel Courts, The Northern, Didsbury

Position UN1

Environmental Noise Time History
27 May 2021 to 01 June 2021



APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Acceleration	The rate of change of velocity, often measured in ms^{-2}. Commonly used to assess human response to vibration and for machine condition monitoring.
Accelerometer	A vibration transducer sensor that is used to measure acceleration.
Airborne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
Ambient Vibration	The all-encompassing vibration occurring at a given location, at a given time, composed of all vibration sources near and far.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in a typical young adult detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits. Typically, as a person ages their audible hearing range decreases.
A-Weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
Axis	A fixed reference line for the measurement of vibration in a particular direction. Vibration is commonly measured in transverse (T), longitudinal (L) and vertical (V) axes (or X, Y and Z).
Background Noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. The L_{90} parameter, i.e. the level exceeded for not more than 90% of the time is often used as a descriptor of "background noise" for environmental impact studies.
Background Vibration	The underlying level of vibration in the ambient environment, measured in the absence of the vibration sources of interest.
Continuous Vibration	Vibration that continues uninterrupted over a defined period.
dB(A)	The human ear is less sensitive to low (below 125 Hz) and high (above 16 kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).
Decibel [dB]	The unit that sound is measured in. Decibels are a logarithmic scale hence two equally intense sound sources operating together produce a sound level which is 3 dB higher than one alone and 10 identical, uncorrelated sources produce a 10 dB higher sound level.
Distance Attenuation	Sound which propagates from a point source in free air attenuates by 6 dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3 dB for each doubling of distance.
$D_{nT,w}$	Weighted Standardised Field Level Difference A measure of sound insulation performance of a building element. It is characterised by the difference in noise level on each side of a wall or floor. It is measured in-situ. It is a field measurement that relates to the R_w laboratory measured value but is not equal to it because an in-situ space is not of the same quality as a laboratory space. The value is indicative of the level of speech privacy between spaces. The higher its value the better the insulation performance.
Flanking	Flanking is the transfer of sound through paths around a building element rather than through the building element material directly. For example, sound travelling through a gap underneath a door or a gap at the top of a wall.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch, and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz. In the case of vibration, frequency is the number of oscillations that occurs per second. Frequency is measured in units of Hertz (Hz).
Ground-Borne Noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.
Impact Noise	Impact noise / structure-borne noise is generated when an object impacts with a separating element, causing that element to vibrate and re-radiate as noise in the receiving room. Common domestic examples of impact noise include footsteps and dropping objects.
Impulsive Noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.

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Impulsive Vibration	Vibration that rapidly builds up to a peak followed by a damped decay. May consist of multiple impulsive events, typically less than two seconds in duration.
Intermittent Noise	The level suddenly drops to that of the background noise several times during the period of observation.
Intermittent Vibration	Either interrupted periods of continuous vibration or repeated periods of impulsive vibration.
L_{10}	This is the level exceeded for not more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise
L_{90}	This is the level exceeded for not more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.
L_{eq}	The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.
L_{max}	This is the maximum sound pressure level that has been measured over a period.
$L_{nT,w}$	Weighted Standardised Field Impact Sound Pressure Level As for $L_{n,w}$ but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The equivalent measurement in a laboratory is the $L_{n,w}$. A lower value indicates a better performing floor.
Noise	Unwanted sound.
Octave	An octave represents a doubling or halving in frequency. Noise or vibration levels across a frequency spectrum are commonly given in octave or one-third octave frequency bands.
PPV	Peak Particle Velocity. The absolute maximum value of the vibration velocity signal measured in any axis during a given time interval.
Reflection	Sound wave reflected from a solid object obscuring its path.
R_w	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The related field measurement is the $D_{nT,w}$. The higher the value the better the acoustic performance of the building element.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound Absorption	The ability of a material to absorb sound energy by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the R_w and the sound insulation between two rooms can be described by the $D_{nT,w}$.
Sound Level Meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound Power Level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 pico watt.
Sound Pressure Level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 micro Pascal.
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft.
Subjective Impression of Noise	Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

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Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100 dB and 65 dB on the other side, it is said that the transmission loss of the wall is 35 dB. If the transmission loss is normalised or standardised, it then becomes the R_w or R'_w or $D_{nT,w}$.
VDV	Vibration Dose Value. A measure of tactile vibration levels used to assess intermittent vibration.
Velocity	The rate of change of vibration displacement, usually measured in mms^{-1}.
Vibration	A mechanical phenomenon whereby oscillations occur about an equilibrium point; a periodic back-and-forth motion of an elastic body or medium, commonly resulting when almost any physical system is displaced from its equilibrium condition.