

Noise impact assessment of a proposed residential development

120-124 Grosvenor Street, Manchester, M1 7HL



Client: Grosvenor Holding MCR Limited

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0. SUMMARY

- 0.1. ACA Acoustics Limited has been commissioned to assess the acoustic impact of existing noise sources on a proposed new residential development at 120 – 124 Grosvenor Street, Manchester. The assessment has been prepared to support a planning application to the Local Planning Authority, Manchester City Council.
- 0.2. The development is at first and second floor levels of the development site, with an existing restaurant/bar at ground floor level remaining. The development site is close to nearby traffic routes, along with an events venue, The Bread Shed.
- 0.3. A sound level survey has been carried out over a weekend and weekday period between the 4th to the 8th April 2025. Whilst on site ACA Acoustics' consultant considered the dominant sound source to be traffic from nearby routes, along with nearby mechanical plant, including that serving the ground floor restaurant. A second manned sound level survey of the nearby Bread Shed events venue was carried out during the evening of the 25th April while a music event was occurring.
- 0.4. Summary results of the sound level survey to the most noise-affected façade of the development are shown in the table below.

Location	Daytime LAeq	Night-Time LAeq	Night-Time Typical LAfmax
Southern corner of the development site, overlooking the junction of Grosvenor Street, York Street, and Sidney Street	62dB	60dB	79dB
Northern corner of the development site, overlooking the external seating area of the ground floor restaurant, and fan louvre of the ground floor restaurant kitchen	64dB	64dB	83dB

Table 1: Summary sound level survey results to the most-affected façade of the development

Measured sound levels to the southern facades during a music event at The Bread Shed are shown in the table below.

Location	LAeq
Southern corner of the development site, overlooking The Bread Shed during a music event	62dB

Table 2: Summary sound level survey results to the most-affected façade of the development

- 0.5. A Stage 1 Initial Site Noise Risk Assessment, in accordance with ProPG Planning & Noise, identifies the site as being in an area with a medium-high noise risk and therefore an Acoustic Design Statement has been prepared to adequately mitigate the potential impacts.
- 0.6. In addition, An assessment of noise from industrial and commercial sources in the vicinity of the site in accordance with BS 4142:2014+A1:2019, along with assessment of noise emissions from the nearby events venue The Bread Shed in accordance with guidance within NANR 163 indicates that without mitigation, noise from industrial/ commercial sources in the vicinity is at a level where there is a likelihood of adverse impact to future occupants.
- 0.7. A Stage 2 detailed acoustic design process has been followed, in accordance with ProPG. Details of the Acoustic Design Statement are included in this report.
- 0.8. During the Stage 2 acoustic design process a scheme for sound insulation of the building envelope has been developed such that internal sound levels are at least 5dB lower than guideline limits at bedrooms to the northern façade due to the presence of audible mechanical plant for a good standard of amenity to living rooms and bedrooms set out in ProPG and BS 8233:2014 whilst considering the type of noise sources. Confirmation of worst-case internal sound levels to the most-affected dwellings are shown in the table below.

Description	Daytime LAeq	Night-Time LAeq	Night-Time LAfmax	BS8233/ProPG Compliance
Internal sound levels to habitable rooms	25dB	25dB	43dB	Achieved

Table 3: Calculated internal sound levels to the most-affected habitable rooms within the proposed development

- 0.9. ACA Acoustics have proposed acoustic performance criteria for the separating floor between the ground floor bar/restaurant, and the first-floor proposed residential units, based on relevant guidance, which may be conditioned.
- 0.10. In conclusion, it is recommended that the site is suitable for the residential development, subject to implementation of the mitigation set out in the Acoustic Design Statement, and planning consent may be granted for the proposed development.

1. INTRODUCTION

A planning application is to be submitted for a new residential development at 120-124 Grosvenor Street, Manchester.

ACA Acoustics Limited has been commissioned by Grosvenor Holding MCR Limited to carry out a survey and assessment of external sound levels in the vicinity and, where necessary, to make recommendations for a suitable mitigation scheme.

The objective of the assessment is to determine the impact that existing noise sources would have on the proposed residential dwellings in accordance with ProPG: Planning & Noise, national planning policies, and other relevant British Standards and guidance documents.

This report presents results of the sound level survey, along with ProPG Stage 1 and Stage 2 assessments.

2. ACOUSTIC CRITERIA

2.1. National Planning Policy Framework (NPPF) and Noise Policy Statement for England (NPSE)

The National Planning Policy Framework (referred to as NPPF) sets out the Government's planning policies for England and provides guidance on how these are expected to be applied, providing a framework within which Local Authorities can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Paragraph 187 of the NPPF states that,

"Planning policies and decisions should contribute to and enhance the natural and local environment by ... e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability".

Paragraph 198 also talks specifically about noise and advises,

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- *Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life.*

- *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason”.*

The Government’s long-term policy aims relating to noise are contained in the Noise Policy Statement for England (referred to as NPSE). Stated aims of the NPSE are,

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy of sustainable development:

- *Avoid significant adverse impacts on health and quality of life,*
- *Mitigate and minimise adverse impacts on health and quality of life, and*
- *Where possible, contribute to the improvement of health and quality of life”.*

Paragraphs 2.19 to 2.24 of the NPSE clarify the above aims, referring to established concepts from toxicology; NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level). It also introduces a new concept relating to “significant adverse” of SOAEL (Significant Observed Adverse Effect Level), however noting,

“It is not possible to have a single objective noise-based measure that describes SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times”.

The first aim of NPPF Paragraph 198 and the second underlying aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development, as set out in the NPPF. As neither the NPPF nor NPSE includes any numerical criteria, it is necessary to consider guidance provided in other documents to determine suitable limits that would define the LOAEL on an individual basis.

Finally, it is also of benefit to consider Paragraph 2.7 of the NPSE, which advises that,

“... the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications”.

This provides clear guidance that noise must not be considered in isolation but as part of the overall scheme taking into account the overall sustainability and associated impacts of the proposed development; there is no benefit in reducing noise to an excessively low level if this creates or increases some other adverse impact. Similarly, it may be appropriate in some cases for noise to have an adverse impact if this is outweighed by the reduction or removal of some other adverse impact that is of greater significance.

2.2. Planning Practice Guidance (PPG-N)

Related to the NPSE and the NPPF, The Department for Communities and Local Government has published additional guidance and clarifications within the Planning Practice Guidance – Noise (PPG-N), available at <https://www.gov.uk/guidance/noise--2>.

Paragraph 003 of the PPG advises that,

“Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

- *Whether or not a significant adverse effect is occurring or likely to occur;*
- *Whether or not an adverse effect is occurring or likely to occur; and*
- *Whether or not a good standard of amenity can be achieved”.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure ... is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation”.

This guidance is like that set out in the NPPF and NPSE, however, Paragraph 005 of the PPG-N provides outline guidance of the definition of “significant adverse” and “adverse” effects. A copy of the table appended to Paragraph 005 is repeated below.

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Figure 1: Noise exposure hierarchy, taken from Planning Practice Guidance - Noise

Although this table provides descriptions of definitions for the NOEL, LOAEL, and SOAEL, as with the NPPF and NPSE there are no numerical values provided.

Paragraph 011 of the PPG-N also provides examples where the noise impact may be offset, including through the use of local amenity areas, noting,

“Noise impacts may be partially offset if residents have access to one or more of:

- *A relatively quiet facade (containing windows to habitable rooms) as part of their dwelling.*
- *A relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects.*
- *A relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or*
- *A relatively quiet, protected, external publicly accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5-minute walking distance).*

Occupants of the new properties will have access to All Saints Park and a number of other green spaces within a 5 minute walking distance.

2.3. ProPG: Planning & Noise

ProPG: Planning & Noise is a collaborative document prepared by the Institute of Acoustics, Association of Noise Consultants, and the Chartered Institute of Environmental Health.

The document brings together guidance and recommendations in assessing the noise impact on new residential developments from various documents including the NPPF, NPSE, PPG-N, BS 8233:2014 and the World Health Organisation guidance. The aim is to regularise the assessment process and to encourage good acoustic design for new noise-sensitive developments.

The assessment process is split into two sequential stages:

- Stage 1 – An initial noise risk assessment of the proposed development site, and
- Stage 2 – A systematic consideration of four key elements:
 - Element 1 – Demonstrating a “*Good Acoustic Design Process*”
 - Element 2 – Observing internal “*Noise Level Guidelines*”
 - Element 3 – Undertaking an “*External Amenity Area Noise Assessment*”, and
 - Element 4 – Consideration of “*Other Relevant Issues*”.

The Stage 1 risk assessment requires sound levels to be measured at the site over daytime and night-time periods and, if necessary, any anticipated significant changes to the climate to be predicted to determine a “‘*typical worst case*’ 24-hour day either now or in the foreseeable future”.

The assessment should include all relevant sources of transport noise that affect the site, (including road, railway, and aircraft sources). It may also include industrial and commercial noise, where this is present but not dominant.

The measured/calculated daytime LAeq, 16-hour and night-time LAeq, 8-hour sound levels are then compared with Figure 1 of ProPG to complete the site’s initial noise risk assessment. Copy of Figure 1 from ProPG is included in Figure 2 below.

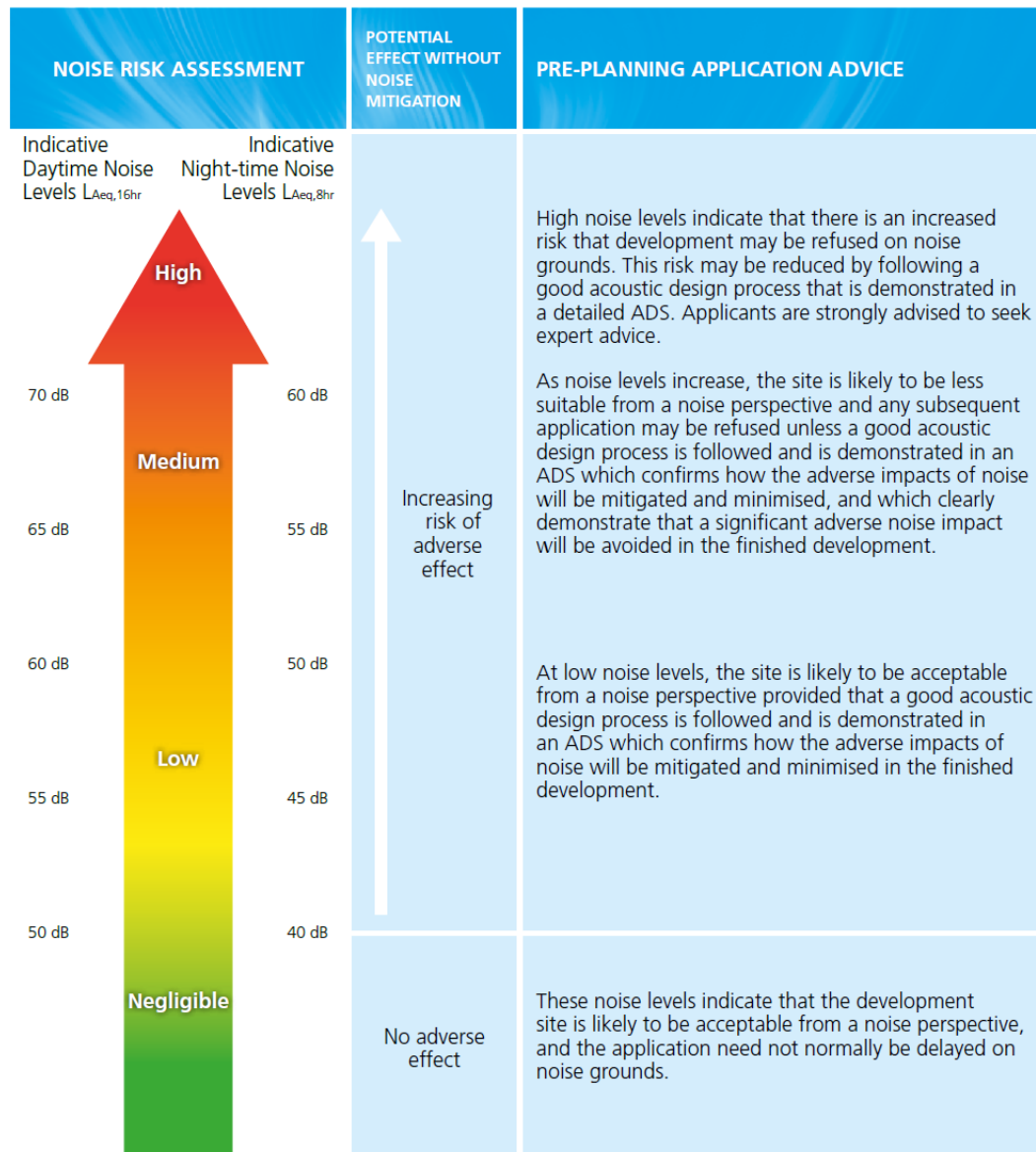


Figure 1 Notes:

- Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.
- Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".
- $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.
- An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.

Figure 2: Noise Risk Assessment, taken from Figure 1 of ProPG: Planning & Noise

The outcome of the Stage 1 initial risk assessment determines the next step and whether an Acoustic Design Statement is necessary. It is of benefit to note guidance in Paragraph 2.10 of ProPG,

“The indicative noise levels are intended to provide a sense of the noise challenge at a potential residential development site and should be interpreted flexibly having regard to the locality, the project and the wider context”.

A site being placed in the High-Risk category, for example, is not necessarily an indication that the development should be refused, but rather should be viewed taking into account the context of the development and highlights the importance of following a good acoustic design process from an early stage.

Element 2 of the Stage 2 assessment provides recommended internal sound levels to the residential dwellings. Criteria are taken from BS 8233:2014 with an additional criterion for individual short-term sound levels at night (LAfmax) and various clarifications and notes. These include an expansion on advice relating to the potential relaxation of the internal sound levels which is often overlooked when considering BS 8233:2014.

Paragraphs 2.33 to 2.36 discuss the impact of ventilation and opening windows. It is clearly stated that,

“Most residents value the ability to open windows at will, for a variety of reasons, and LPAs should therefore normally request that designers principally aim, through the use of good acoustic design, to achieve the internal noise level guidelines in noise-sensitive rooms with windows open”.

However, Paragraph 2.33 confirms that an open window typically reduces the sound insulation performance of the façade to 10 to 15dBA. This means that any site with a noise risk assessment above “Negligible” would fail to achieve the internal sound level criteria with windows open.

There is an occasional misconception that the internal sound level limits should be achieved with windows open, to mitigate overheating. This is not the intention of ProPG or BS 8233; residents would normally accept higher sound levels as a consequence of opening their windows. Paragraph 2.34 acknowledges this, confirming that internal sound levels for sites in urban areas and adjacent to transportation noise sources may only be practically achieved with windows closed.

“In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide “whole dwelling ventilation” in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position. Furthermore, in this scenario the internal LAeq target noise levels should not generally be exceeded”.

As such, ACA Acoustics have assessed noise intrusion into the properties with windows closed and passive ventilators open.

Copy of Figure 2 of ProPG is included in Figure 3 below.

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\text{ hr}}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\text{ hr}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\text{ hr}}$	30 dB $L_{Aeq,8\text{ hr}}$ 45 dB $L_{Amax,F}$ (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (see Section 3.D).

Figure 3: Internal sound level guidelines, taken from Figure 2 of ProPG: Planning & Noise

Sound levels in external amenity areas are considered in Element 3 of the Stage 2 assessment. This requires that, where practical, sound levels in amenity areas that are an intrinsic part of the overall design, should ideally not be above the range $L_{Aeq,16\text{-hour}}$ 50dB to 55dB. It does however quote BS 8233:2014, that,

"These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these amenity spaces but should not be prohibited".

2.4. The Building Regulations Approved Document O

Although not applicable to planning matters, it is beneficial to consider the impact of how complying with The Building Regulations Approved Document O will affect the ventilation strategy.

Requirement O1 of Schedule 1 to The Building Regulations 2010 requires that the following is met.

Requirement	
Requirement	Limits on application
O1 Overheating mitigation	
(1) Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to—	
(a) limit unwanted solar gains in summer;	
(b) provide an adequate means to remove heat from the indoor environment.	
(2) In meeting the obligations in paragraph (1)—	
(a) account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and	
(b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it.	

Figure 4: Requirement O1 of The Building Regulations 2010

The aim of Requirement O1 is to protect the health and welfare of the occupants of residential buildings, by reducing the occurrence of high indoor temperatures.

Where practical, this should be achieved through limiting solar gains through the design of the building and façade elements. Excess heat should then be removed through opening windows, ventilation louvres in external walls, a mechanical ventilation system, or a mechanical cooling system. Paragraph 2.11 of Approved Document O confirms that *"The building should be constructed to meet requirement O1 using passive means as far as reasonably practicable"*.

However, requirement O1(2)(a) requires that any successful overheating mitigation strategy must also consider other potential adverse impacts, including sound levels inside bedrooms at night.

Paragraphs 3.2 and 3.3 consider the impact of noise on the overheating strategy. These have been included below.

- 3.2 *In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).*

3.3 *Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.*

a. *40dB LAeq, T averaged over 8 hours (between 11pm and 7am).*

b. *55dB LAfmax more than 10 times a night (between 11pm and 7am).*

The Association of Noise Consultants have issued guidance on complying with the requirements of Approved Document O. They recommend that a 10dB open window loss is suitable for most areas.

On this basis, where sound levels incident on a bedroom window do not exceed LAeq, 8-hour 50dB and LAfmax 65dB more than 10 times per night, then the criteria in paragraph 3.3 of Approved Document O should be achieved and an overheating mitigation strategy allowing for open windows is appropriate.

If external sound levels exceed these levels then it is likely windows will be closed by occupants overnight. Note that this does not mean that windows should be sealed closed as most residents would desire the choice of whether to open windows or not. For example, a resident may choose to open windows to a bedroom to help mitigate overheating to the property whilst the bedroom is not in use during the daytime, then close the windows when sleeping in the bedroom overnight.

In accordance with The Building Regulations Approved Document F, it is recommended that if continuous mechanical ventilation is used, sound levels in bedrooms overnight should not exceed a level of LAeq 30dB when the system is operating at its minimum low rate. Although, evidence referenced in The Association of Noise Consultants' *Acoustics Ventilation and Overheating: Residential Design Guide*, notes that "*a more prudent limit for mechanical services noise around 24-26dBA is likely to be required to prevent an adverse reaction from most occupants while falling asleep*".

2.5. British Standard BS 8233:2014

The introduction to BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* advises that "*this guide suggests criteria, such as suitable sleeping/resting conditions, and proposes noise levels that normally satisfy these criteria*". As such it is considered that guideline noise limits set out in BS 8233:2014 are suitable to protect future occupants of the dwelling from noise disturbance and compliance with these values would ensure sound levels within the new development are below the Lowest Observed Adverse Effect Level and comply with the principles of the NPPF, NPSE and PPG-N, along with corresponding to the recommended criteria provided by the Local Authority.

Guidance limits for internal sound levels within living rooms and bedrooms, taken from Table 4 of BS 8233:2014, are shown in Table 4 below.

Activity	Location	Daytime 07:00 – 23:00	Night-Time 23:00 – 07:00
Resting	Living Room	LAeq, 16-hour 35dB	-
Dining	Dining Room/Area	LAeq, 16-hour 40dB	-
Sleeping (daytime resting)	Bedroom	LAeq, 16-hour 35dB	LAeq, 8-hour 30dB

Table 4: BS 8233:2014 indoor ambient sound levels for dwellings

Where the noise sources under assessment contain acoustic characteristics which could make the source more noticeable or disturbing then it may be appropriate to achieve lower criteria than those shown. For this assessment where industrial and commercial noise sources have been identified, a correction of -5dB to the criterion is appropriate to protect the amenity of future occupants.

2.6. British Standard BS 4142:2014+A1:2019

Where a proposed residential development may be influenced by existing noise from commercial or industrial sources, it is appropriate for the potential impact to be assessed in accordance with the methodology set out in BS 4142:2014+A1:2019. The scope of BS 4142:2014+A1:2019 advises,

“This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature ... to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident”.

The assessment method of BS 4142:2014+A1:2019 corrects the specific sound level from the source under investigation to account for characteristics that could make the sound more obtrusive to obtain a rating level. This rating level is compared against the prevailing background noise outside the noise-sensitive property.

While BS 4142:2014+A1:2019 is routinely used to assess the potential for an adverse impact on residential occupants due to commercial or industrial noise, it is important to consider that the scope of BS 4142:2014+A1:2019 specifically confirms that,

“Sound of an industrial and/or commercial nature does not include sound from the passage of vehicles on public roads and railway systems”.

In accordance with BS 4142:2014+A1:2019 and other relevant guidance, commercial noise does not include vehicles travelling in the vicinity.

2.7. Operational Noise from Nearby Night Clubs, Bars, and Events Venues - DEFRA NANR 163

The development is situated close to The Bread Shed events venue, as well as other nearby pubs and bars, in addition to an existing bar to be retained at ground floor level. As a result, assessment of noise from these sources is appropriate.

There is no specific methodology within British Standards or other formal government guidance to assess noise emissions from premises with amplified music/speech potentially affecting nearby residential occupiers. However, a general requirement of most Local Authorities is that any noise breakout from such premises shall not cause a nuisance to any nearby residents.

The Department for Environment, Food, and Rural Affairs (DEFRA) commissioned a study into noise from pubs and clubs affecting nearby noise-sensitive properties. The final report of the study (NANR 163 authored by BRE and Capita Symonds) concluded that the metric that provided the best overall prediction of likelihood for adverse impacts was an absolute internal LAeq noise level value within a dwelling. A level of LAeq 27dB was considered to be 'clearly acceptable' while a level of LAeq 31dB had a semantic description of 'just acceptable'.

These sound levels are pertinent to venues operating overnight, as stated in Paragraph 2.6 of the document:

"The primary objective is to provide a set of criteria and methodologies best suited for assessment of entertainment noise from pubs and clubs at night"

Events at The Bread Shed are understood to occur only during daytime hours, and as such a criteria of LAeq 31dB during daytime hours is considered appropriate as providing an acceptable criteria for music noise intrusion and being noticeably better than the general criteria in living rooms and bedrooms to 23:00 hours in BS 8233:2014 of LAeq 35dB.

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The site currently comprises a bar at ground floor level, with unused office and storage spaces at first and second floor levels. ACA Acoustics understands that the ground floor bar plays only background music, and the acoustic climate is more that of a restaurant than a typical bar.

To the northern facades of the development site the ground floor bar has an external seating area, along with mechanical plant serving the kitchen.

To the South of the development is The Bread Shed, which adjoins a pub. The Bread Shed is an events venue with around 3 or 4 events per month. These typically include comedy and live music events.

Farther afield the acoustic climate primarily comprises road traffic, along with lower-level mechanical plant from other non-associated sources in the area.

A marked-up aerial image is included in Figure 5, identifying the existing site and surrounding area, along with the sound level survey measurement position.

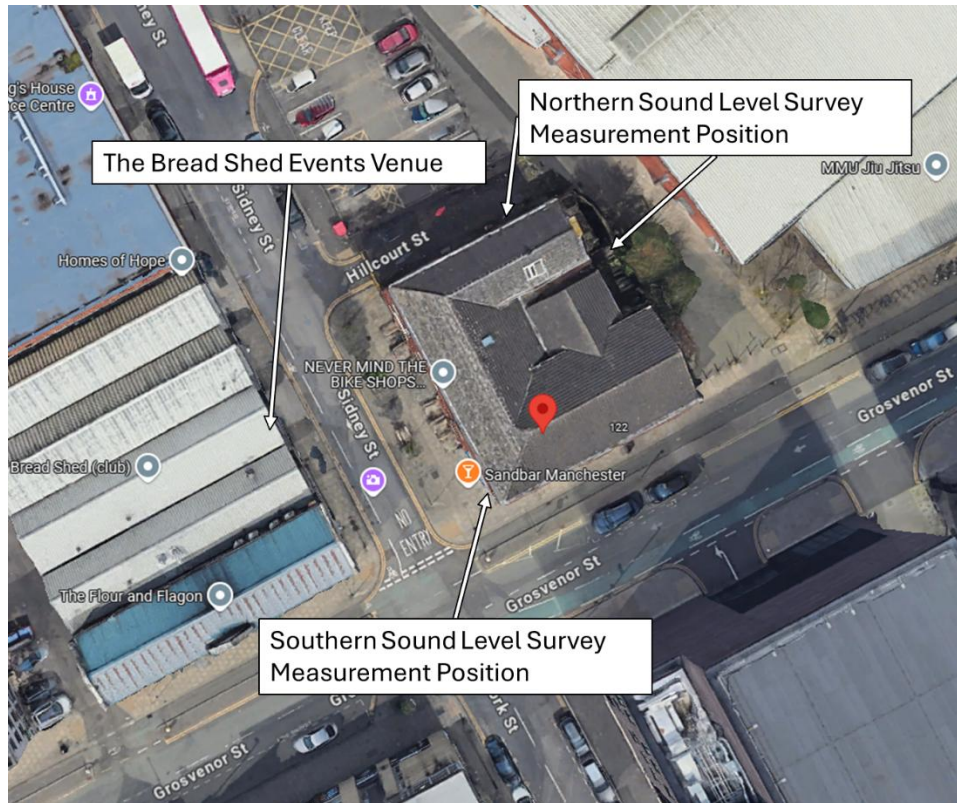
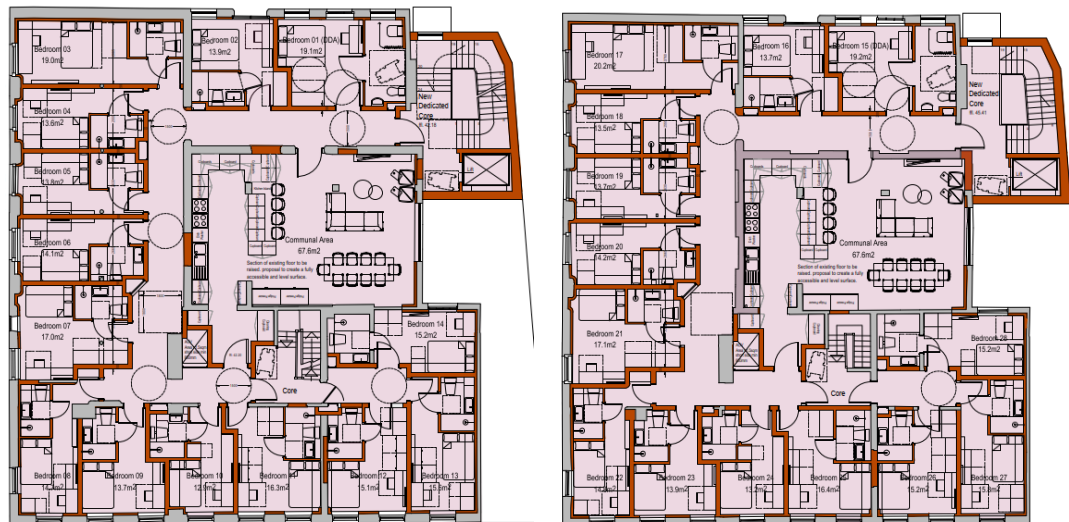


Figure 5: Site location plan (available at www.google.com/maps)

The proposals are for 28 new student accommodation rooms over first and second floors, along with a communal living space on each of the first and second floors. A drawing showing the proposed dwellings, is included in Figure 6 below.



Proposed 1st Floor Plan - 14No. Student Accommodation

Proposed 2nd Floor Plan - 14No. Student Accommodation

Figure 6: Proposed layout for the new development

4. SOUND LEVEL SURVEY

To assess the impact of existing sound sources, a survey has been conducted at the development site to determine sound levels incident on the proposed residential dwellings.

The sound level survey was set up by Tommy Burn of ACA Acoustics and carried out over nominally a 4-day period between 4th and 8th April 2025.

Two survey measurement positions were used for the survey as shown in Figure 5 above. The northern position, at first floor level, was overlooking the external dining space of the ground floor restaurant, and the southern position, at second floor level, overlooked the nearby pubs and traffic on Grosvenor Street.

In addition, on the 4th April manned measurements of the nearby mechanical plant serving the ground floor bar kitchen were taken, and a subsequent survey on the 25th April was conducted to the Southern Façade location during an event at The Bread Shed.

The survey of the event at The Bread Shed was of a heavy metal band and included sound levels from the performers' bus parked up outside the events venue for the duration of the event. This bus was kept with engine running, understood to be providing some power generation for the event. The venue was witnessed to have door lobbies to access doors facing onto the development site and survey position, and sound levels from music within the venue was subjectively audible at only a low level.

The following equipment was used during the survey. An on-site calibration check was conducted on the sound level meter prior to the survey and repeated after with no deviation noted.

Survey Dates	Equipment	Serial Number
4 th – 8 th April, background survey	NTi Audio Class 1 sound level meter type XL2-TA complete with weatherproof and lockable outdoor environmental kit	A2A-10964-E0
	Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003	83826
	Svantek Class 1 sound level meter type SVAN971, complete with MOLES weatherproof and lockable outdoor environmental kit	84045
	Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003	83826
4 th April manned survey of nearby mechanical plant	NTi Audio Class 1 sound level meter type XL2-TA	A2A-16877-E0
	Svantek calibrator type SV33B. Compliant to IEC 60942:2003	57595
25 th April Manned survey of event at The Bread Shed	Svantek Class 1 sound level meter type SVAN971, complete with MOLES weatherproof and lockable outdoor environmental kit	84045
	Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003	83826

Table 5: Equipment used for the sound level survey

Weather conditions throughout all the survey periods remained calm, dry, and cool. Weather conditions have been reviewed at www.worldweatheronline.com, using the closest available commercial weather station. Weather conditions remained predominantly calm and dry with wind speeds below recommended limits during the proposed equipment operation times. Meteorological conditions are considered acceptable and will not have adversely impacted the survey results.

4.1. Unmanned Sound Level Survey Results

Results of the unmanned survey are shown in graphical form in Figure 7 and Figure 8 below.

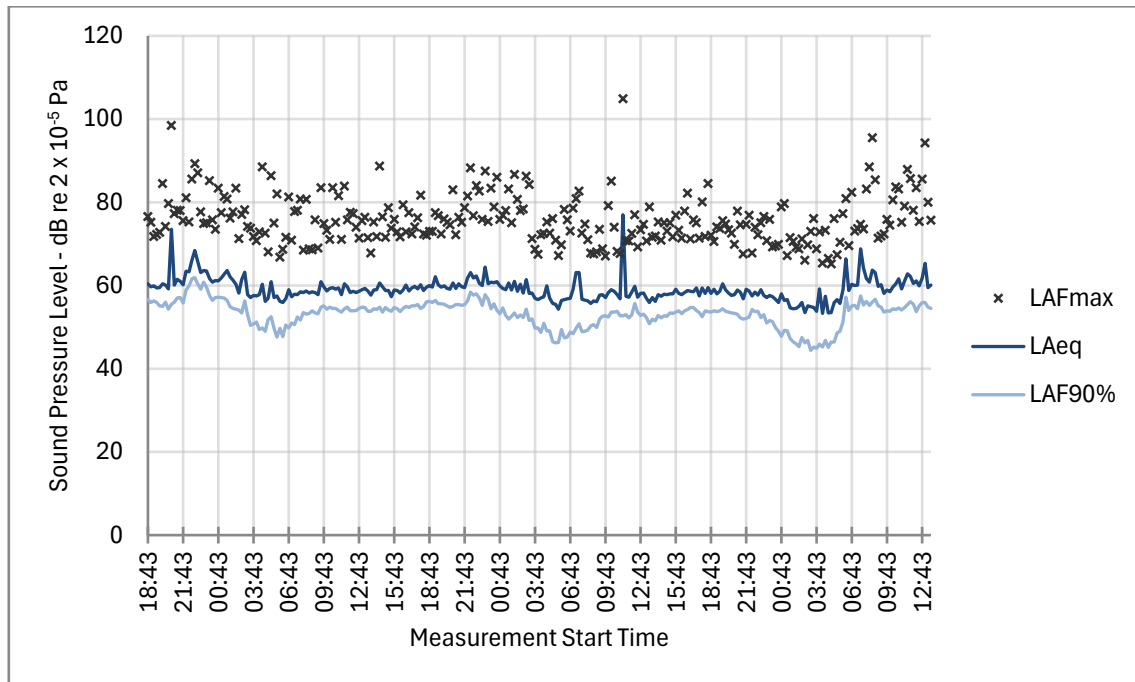


Figure 7: Sound level survey results – 4th – 8th April, Southern Position

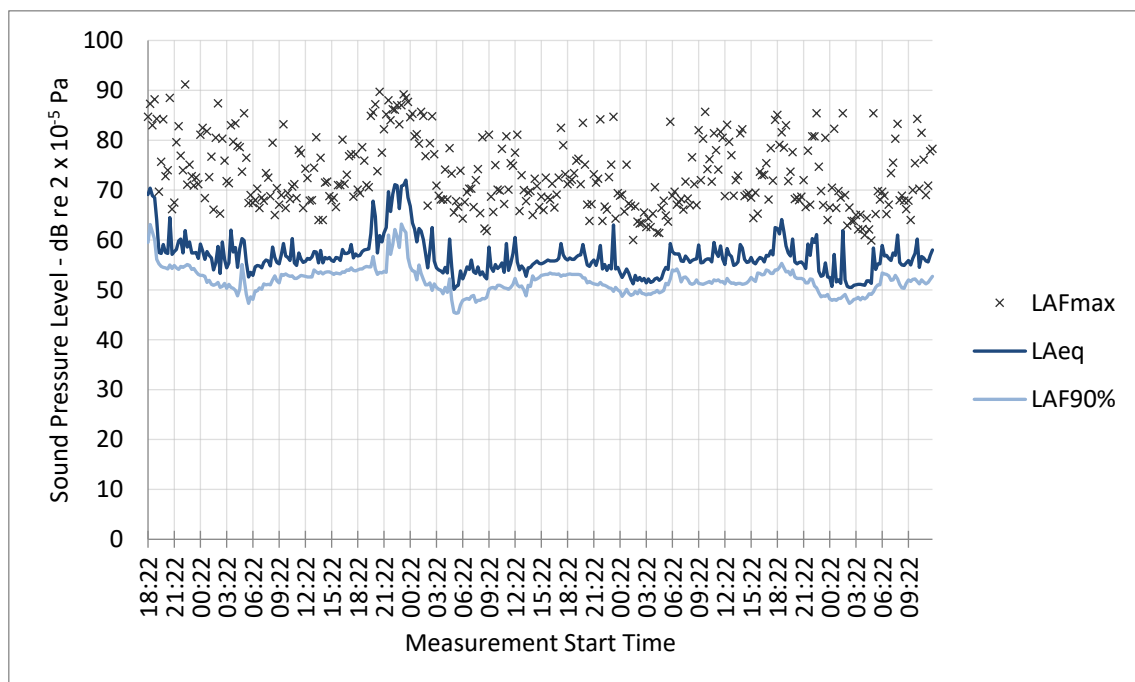


Figure 8: Sound level survey results – 4th – 8th April, Northern Position

Unmanned sound level survey results show raised sound levels during the weekend evening periods, This is more prominent to the Northern position on the Saturday night, where the external seating area of the ground floor bar was being used.

Summary sound level survey results are shown in Table 6 below.

Assessment Location	Daytime (07:00 – 23:00) LAeq	Night-Time (23:00 – 07:00) LAeq	Night-Time (23:00 – 07:00) Typical LAfmax
Northern Façade	64dB	64dB	83dB
Southern Facade	62dB	60dB	79dB

Table 6: Summary sound level survey results

4.2. Mechanical Plant Manned Sound Level Survey Results

Results of the mechanical plant survey are shown below.

Assessment Location	Plant on	Plant off	Specific sound level
At the external louvre of the ground floor bar kitchen	LAeq 64dB	LAeq 58dB LA90 54dB	63dBA

Table 7: Sound level survey results from mechanical equipment

Assessment of the mechanical plant has been undertaken as part of this assessment in Section 5.

4.3. Music Noise Manned Sound Level Survey Results

Results of the event at The Bread Shed measured at the Southern façade of the development site overlooking the Bread Shed are shown below in octave bands to account for low frequency noise within the calculations.

Description	Octave Band Frequency (Hz)								dBA
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
At nearest façade to The Bread Shed During Music Event (Leq)	78dB	63dB	60dB	60dB	58dB	52dB	44dB	39dB	62dBA

Table 8: Sound level survey results from music event at The Bread Shed

5. ASSESSMENT OF COMMERCIAL NOISE

5.1. Acoustic Assessment of Industrial and Commercial Noise Sources

Industrial/commercial noise is subjectively audible at the development site. This is primarily from the kitchen equipment to the ground floor bar. Assessment of the mechanical plant audible at the site facade in accordance with the requirements of BS 4142:2014+A1:2019 is shown below.

5.2. BS 4142:2014+A1:2019 Assessment

A BS 4142:2014+A1:2019 assessment of industrial noise from the in the vicinity has been conducted in Table 9 below.

Description	Mechanical Plant	Relevant Clause	Commentary
Specific sound level	LAeq 63dB	7.1, 7.3.6	Measured at a position representative of the nearest first floor window overlooking the fan louvre.
Background sound level	LA90 54dB	8.1.3, 8.3	Representative 15 minute background sound level after the equipment powers off
Acoustic feature correction	Mechanical Characteristics: +3dB	9.2	The ground floor kitchen extract fan is not tonal, impulsive, or intermittent, however it is clearly audible over the prevailing acoustic climate, and so in accordance with guidance in BS 4142, a +3dB correction has been applied.
On time correction	0dB		The plant powers off at around 21:30 hours, and remains powered off after that time. No on time correction is applicable.
Rating level	LAr 66dB	9.2	
Excess of rating level over background sound level	+12dB	11	Assessment indicates likelihood of significant adverse impact from the mechanical plant to the nearest residential windows

Table 9: BS 4142:2014+A1:2019 Assessment

The initial outcome of the BS 4142 assessment from noise emissions of industrial/ commercial nature in the vicinity, is that, without mitigation, there is a likelihood of significant adverse impact, depending on the context.

The primary context of this assessment is that noise of industrial/ commercial nature is only operational during the daytime period. It is the opinion of ACA Acoustics' consultant that this reduces the overall impact of the noise due to the daytime-only operation.

Section 11 of BS 4142:2014 discusses potential aspects which may alter the initial assessment result and advises that:

“Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following ... the sensitivity of the receptor and whether dwellings ... will incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

- i) Façade insulation treatment;*
- ii) Ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation”, and;*
- iii) Acoustic screening.*

This confirms that designing the sound insulation performance of façade elements to achieve appropriate internal sound levels is required to mitigate the adverse impact.

An appropriate scheme of façade sound insulation has been developed to ensure external noise intrusion to the dwellings is lower than that stated within the guideline criteria of BS 8233:2014. The industrial and commercial noise sources only occur during daytime hours, and criteria used within this assessment is 5dB more stringent than that found within BS 8233:2014, requiring daytime sound levels to not exceed LAeq 30dB. This more stringent acoustic criteria reflects the outcome of the BS 4142:2014+A1:2019 assessment, and will ensure the amenity of future occupants is protected.

5.3. Assessment of Operational Noise from Nearby Night Clubs & Bars

As detailed within Section 2.7, based on guidance within NANR163, an internal criterion of LAeq 31dB within the proposed properties due to noise intrusion from nearby pubs and clubs is appropriate to ensure a good level of amenity to the proposed flats during the evening.

ACA Acoustics' survey and observations on site indicate sound levels from patrons in the ground floor external seating area, along with noise from The Bread Shed.

An appropriate mitigation scheme to control noise intrusion to within the new flats is included in Section 7.3 below.

6. ProPG STAGE 1 INITIAL NOISE RISK ASSESSMENT

Results of the sound level survey have been plotted on the image in Figure 2 to determine the relevant noise risk category. In accordance with guidance in ProPG, sounds levels to the most noise-affected façade are included in the initial assessment. The initial risk assessment, using the measured sound levels, are included in Table 10 below.

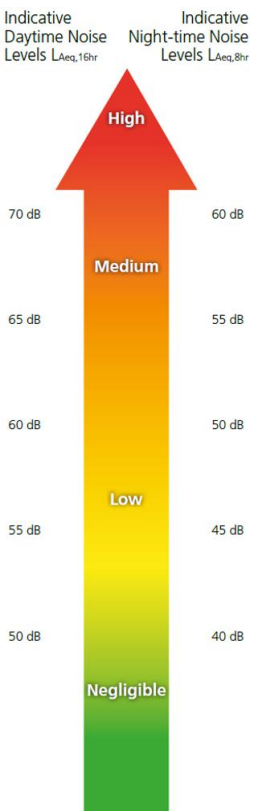
ProPG Stage 1 Noise Risk Assessment	Measured Sound Levels	Assessment Outcome
 The diagram shows a vertical color gradient bar representing noise risk levels. At the top is a red arrow pointing upwards, labeled 'High'. Below it is an orange section labeled 'Medium'. Below that is a yellow section labeled 'Low'. At the bottom is a green section labeled 'Negligible'. To the left of the bar, 'Indicative Daytime Noise Levels LAeq,16hr' are listed: 70 dB, 65 dB, 60 dB, 55 dB, 50 dB. To the right, 'Indicative Night-time Noise Levels LAeq,8hr' are listed: 60 dB, 55 dB, 50 dB, 45 dB, 40 dB.	Daytime (07:00 – 23:00) LAeq 64dB	Daytime - Medium
	Night-time (23:00 – 07:00) LAeq 64dB	Night-Time - High
	Night-time (23:00 – 07:00) LAfmax 83dB	

Table 10: ProPG Stage 1 noise risk assessment

The initial site risk assessment indicates that the site is in an area where there is a medium to high risk of adverse impacts to future occupants of the dwellings, unless an appropriate noise mitigation strategy is implemented.

It is appropriate to consider that this is the raw data and does not include any proposed mitigation. Paragraph 2.12 of ProPG confirms that,

“It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication

of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced”.

7. ProPG STAGE 2 ACOUSTIC DESIGN STATEMENT

As discussed in Section 2.3, Stage 2 of ProPG is separated into four elements: an overview ensuring a good acoustic design process, assessment of internal sound levels, consideration of sound levels in external amenity areas, and finally an assessment of any other relevant issues.

The four elements are considered in more detail within this section.

7.1. Element 1 – Good Acoustic Design Process

The pre-planning application advice contained in ProPG confirms,

“As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS [Acoustic Design Statement] which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrates that a significant adverse noise impact will be avoided in the finished development”.

ProPG and the supplementary documents provide guidance on the typical matters that should be considered in an Acoustic Design Statement. These matters are discussed in Table 11.

Principle/Topic	Discussion
Identify significant existing and potential noise sources and measure or estimate sound levels.	Road traffic, and entertainment and mechanical plant noise from nearby pubs and bars, has been identified as the dominant noise sources. Results of the sound level survey are included in Section 4.
Consider the feasibility of reducing sound levels or relocating noise sources.	It is not feasible to relocate the noise sources as part of this application.
Consider the potential to mitigate sound through planning of the site and orientation of the buildings.	The development comprises single-aspect apartments to each façade of the building and it is not feasible to orientate all noise-sensitive rooms away from the dominant noise source.
Mitigating the sound through use of barriers or screens.	The location of the adjacent road and height of proposed upper floor windows makes mitigating the sound through the use of barriers impractical.
Select construction types and methods to achieve the internal sound level criteria.	An appropriate acoustic specification for façade elements has been proposed. Refer Section 7.3.
Consider the acoustic impact of the proposed ventilation strategy.	This is discussed in more detail in Section 7.2.
Assess sound levels to external amenity areas.	This is discussed in more detail in Section 7.4.
Assess the viability of alternative solutions.	Where appropriate, alternative solutions are discussed, and the most appropriate scheme has been put forward
Examine the effects of noise control measures on ventilation, fire regulation, H&S, costs, CDM, or other unintended consequence	Under the Construction (Design and Management) Regulations 2015, ACA Acoustics are acting as a Designer. This Acoustic Design Statement and the supporting evidence has considered best practice to reduce or control foreseeable risks. It is recommended that other relevant parties, including the Principal Designer, consider all non-acoustic aspects of the design.

Table 11: Acoustic Design Statement details

7.2. Ventilation Strategy

Section 2.3 confirms that any site with a noise risk assessment above ‘Negligible’ would fail to achieve internal sound level criteria with windows open and in this instance ProPG and the supplementary guidance requires that internal sound level criteria are achieved whilst providing the ‘whole dwelling ventilation’ rate as set out in The Building Regulations Approved Document F.

It is usual to satisfy internal sound level criteria whilst achieving the background ventilation rate defined by Approved Document F of the Building Regulations, rather than for the purge ventilation rate. It is therefore anticipated that it will be necessary to incorporate an acoustic ventilation scheme into the design such that residents can achieve background ventilation without necessarily needing to open windows.

Values in Table 12 below show a specification schedule of ventilator sound insulation performance for the development, used in the computer model. Note that there are many different passive ventilators including through-wall type and those built into the window frame. If the $D_{n,e,w}$ performance is not lower than that shown Table 12 then any alternative ventilator may be used.

Description	Location	$D_{n,e,w}$ (dB)	Typical Ventilator Type
Passive Vents	Living rooms	35	Hit & miss trickle vent
	Bedrooms	50	Acoustic trickle vents such as DucoMax SR Largo 15 or equivalent

Table 12: Specification for ventilator acoustic performance

In accordance with Approved Document O of The Building Regulations, if sound levels inside bedrooms exceed $L_{Aeq, 8-hour}$ 40dB or L_{Amax} 55dB more than 10 times per night, then it would not be appropriate to rely on open windows to mitigate overheating.

Ideally the building will be developed to control heat gains, for example through the use of solar shading, however an alternative overheating strategy may be appropriate to ensure that future occupants will not need to open windows in order to mitigate overheating to these bedrooms at night. Detailed thermal design, confirming the ventilation strategy, is beyond the scope of this assessment and should be considered by others accordingly.

7.3. Element 2 – Internal Noise Level Guidelines

A scheme for sound insulation is necessary to ensure sound levels inside rooms of the new development are reasonable and comply with the requirements of BS 8233:2014 and ProPG.

A computer model has been set up using the sound levels incident on the façade of the development along with anticipated façade elements. The computer model is based on the calculation procedures outlined in BS EN ISO 12354-3:2000 and BS 8233:2014.

The assessment is based on drawing reference 7499-PS.02, provided by the client. Confirmation of the acoustic performance of the building envelope elements used in the calculation model is provided below.

Description	Rw (dB)	Rw + C'tr (dB)	Typical Construction
Façade walls	55	51	Traditional solid brick construction
Glazing to living rooms	50	44	High performance laminated double glazing such as 10.5-16-12.76 or equivalent
Glazing to bedrooms	57	52	Very high-performance secondary glazing with laminated or toughened double-glazed outer unit such as 6.4-20-8 configuration or similar, then secondary glazing formed from laminated glazing of minimum 8.8mm thickness pane, set off the outer glazing by minimum 150mm.
Roof to bedrooms	64	61	Roof tiles on pitched roof with 100mm Rockwool insulation in the void, 2 layers 15mm SoundBloc plasterboard to the underside of the rafters, then a MF ceiling of 2 layers 15mm SoundBloc plasterboard supported on acoustic hangers, forming a 150mm cavity and 100mm rockwool in the void.

Table 13: Acoustic performance specification for façade elements

Note that the constructions provided are typical and variations on the specification would be acceptable, so long as the installed construction achieved the specified sound insulation performance. The specification for glazed elements is for the window/door as a complete unit, including frames and seals. It is recommended the glazing supplier submit test data confirming their unit will comply with the specified performance.

Summary results from the calculation model to sample receptors are confirmed in Table 14 below. The sample receptors selected are considered the likely most noise-affected properties/rooms; sound levels to other rooms will be lower. This demonstrates that sound levels within rooms of the proposed residential units will comply with guidance limits in ProPG and BS 8233:2014 as well as the more stringent criteria discussed in Section 2.7 and Section 5 for dwellings facing the commercial noise sources. Printouts from the computer model are included in Appendix A.

Plot/Room	Description	Calculated Internal Sound Level	Criteria
Bedroom 22 to the South façade	Daytime LAeq	25dB	≤35dB
	Night-Time LAeq	23dB	≤30dB
	Night-Time LAfmax	41dB	≤45dB
Bedroom 22 during event at The Bread Shed		31dB	≤31dB
Bedroom 15 to the North facade	Daytime LAeq	25dB	≤30dB
	Night-Time LAeq	25dB	≤25dB
	Night-Time LAfmax	43dB	≤45dB
Communal living room	Daytime LAeq	32dB	≤35dB

Table 14: Summary internal sound levels within sample habitable rooms

7.4. Element 3 – External Amenity Area Noise Assessment

The site does not have dedicated external amenity space. However, in accordance with PPG-N then there are a number of parks within a short walking distance, such as All Saints Park, Gartside Gardens, and other green spaces in the close vicinity, which meet the requirements of Paragraph 011 of the PPG-N.

7.5. Element 4 – Assessment of Other Relevant Issues

All relevant issues have been considered throughout the assessment. No other acoustic issues relevant to the proposed residential development have been identified.

8. ASSESSMENT OF THE SEPARATING FLOOR BETWEEN GROUND FLOOR RETAIL AND FIRST FLOOR RESIDENTIAL

The ground floor unit is a bar, and is proposed to remain so. While on site ACA Acoustics measured sound levels within the bar during a busy Friday evening at around LAeq 75dBA. Simultaneous measured sound levels at first floor level were around LAeq 50dBA, indicating a loss of around 25dBA. The separating floor is currently unsealed floor boards.

Separating floors between dwellings and the commercial space at ground floor level will be required to achieve the minimum sound insulation performance standards set out in The Building Regulations Approved Document E. In accordance with Paragraph 0.8 of ADE, a higher performance

may be appropriate where future occupants of the commercial unit propose higher than typical retail source sound levels.

Allowing for a typical internal sound level in the bar of around LAeq 75dB, then separating floors between the commercial and the new residential flats would need to achieve a sound insulation performance of nominally $D_{nT,w} + C_{tr}$ 50dB to ensure the recommended criteria is achieved.

This is at least 7dB better than the minimum performance standards of the Building Regulations Approved Document E and should ensure a good standard of amenity for future residents of the flats.

It is recommended that this performance standard is controlled through a planning condition and can be verified through tests conducted on the completed structure on site, prior to occupation.

9. CONCLUSION

A planning application is to be submitted for a new residential development at 120 Grosvenor Street, Manchester.

ACA Acoustics have undertaken a sound level survey in the vicinity. A ProPG Stage 1 initial noise risk assessment has indicated the site is in a medium to high-risk area. Through a good acoustic design process ACA Acoustics have developed an Acoustic Design Statement, included in this report.

Allowing for the benefit of the acoustic specification of façade elements shown in this report, calculated internal sound levels within habitable rooms will comply with recommended criteria set out in ProPG and BS 8233:2014.

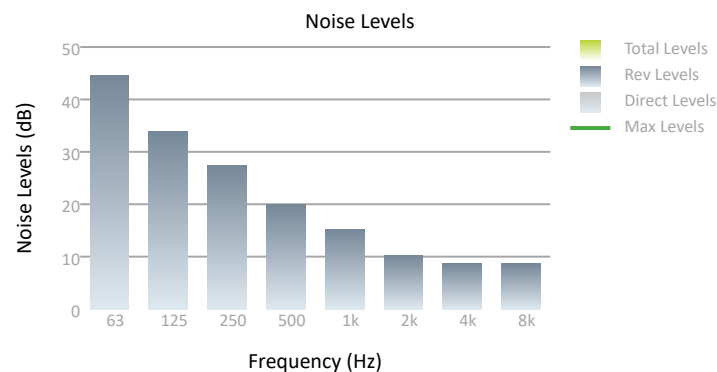
It is the author's opinion that the Acoustic Design Statement has demonstrated that potential adverse or significant adverse impacts can be adequately mitigated to ensure noise is not detrimental to the amenity of future occupants.

In accordance with guidance in ProPG and BS 8233:2014, it is recommended that planning consent for the proposed development should be approved on noise grounds.

Appendix A

Acoustic Calculations

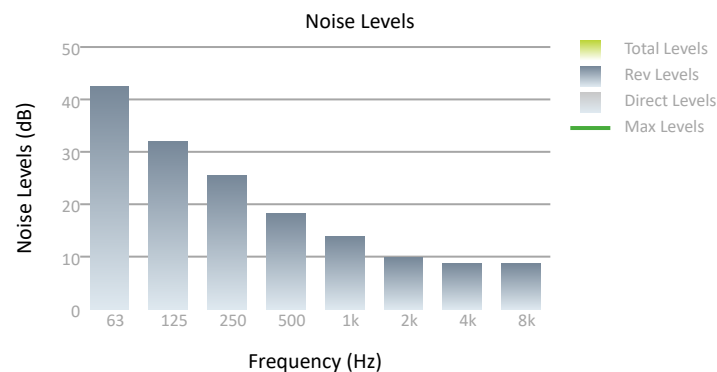
Reference	Bedroom 22 Daytime LAeq
Description	
Target Sound Level	-
Max Sound Level	-
Calculated Sound Level	25dB(A)
Calculated Tmf T60 (s)	0.4
Volume (m ³)	14.4



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	44.5	33.9	27.5	19.9	15.2	10.2	8.8	8.6

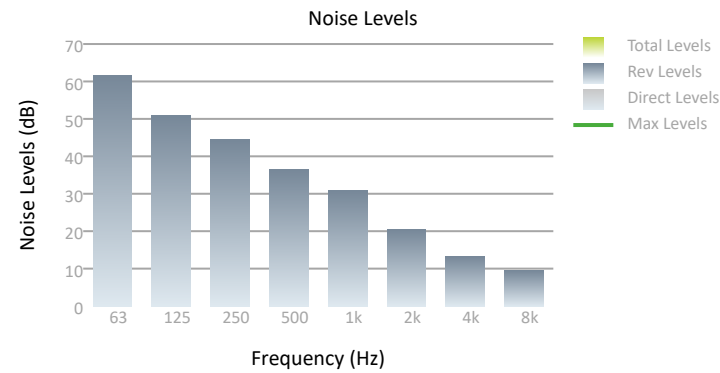
Reference	Bedroom 22 Nighttime LAeq
Description	
Target Sound Level	-
Max Sound Level	-
Calculated Sound Level	23.3dB(A)
Calculated Tmf T60 (s)	0.4
Volume (m ³)	14.4



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Night)	1	42.5	31.9	25.5	18.2	13.9	9.9	8.7	8.6

Reference	Bedroom 22 Nighttime LAfmax
Description	
Target Sound Level	-
Max Sound Level	-
Calculated Sound Level	41.4dB(A)
Calculated Tmf T60 (s)	0.4
Volume (m ³)	14.4



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Lmax, ff (Night)	1	61.5	50.9	44.4	36.4	30.8	20.5	13.3	9.6

Reference

Description

Target Sound Level

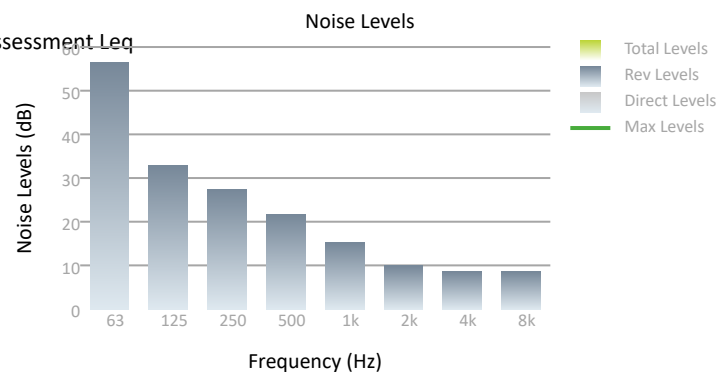
Bedroom 22 The Bread Shed Event Assessment Leq

Max Sound Level

Calculated Sound Level 31.3dB(A)

Calculated Tmf T60 (s) 0.4

Volume (m³) 14.4



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	56.5	32.9	27.5	21.7	15.2	9.9	8.6	8.6

Reference Bedroom 15 Daytime LAeq

Description

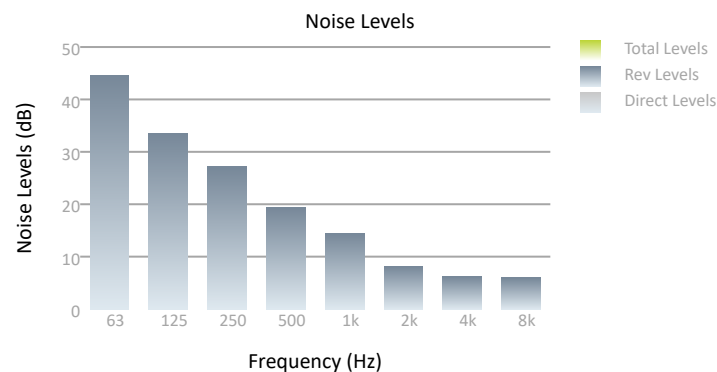
Target Sound Level

Max Sound Level

Calculated Sound Level -

Calculated Tmf T60 (s) 0.4

Volume (m³) 21.6



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	44.7	33.6	27.1	19.4	14.5	8.2	6.2	6.0

Reference Bedroom 15 Night time LAeq

Description

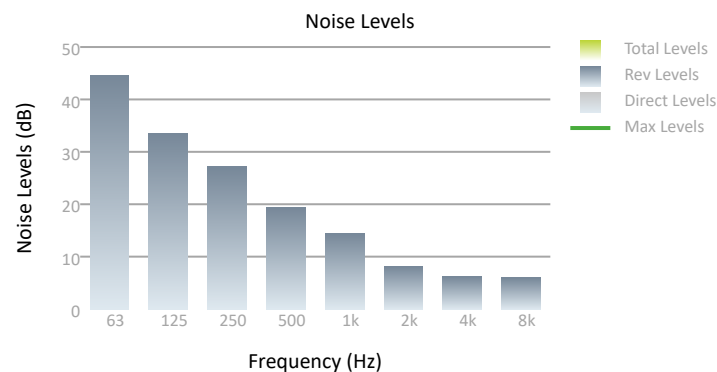
Target Sound Level -

Max Sound Level -

Calculated Sound Level 24.5dB(A)

Calculated Tmf T60 (s) 0.4

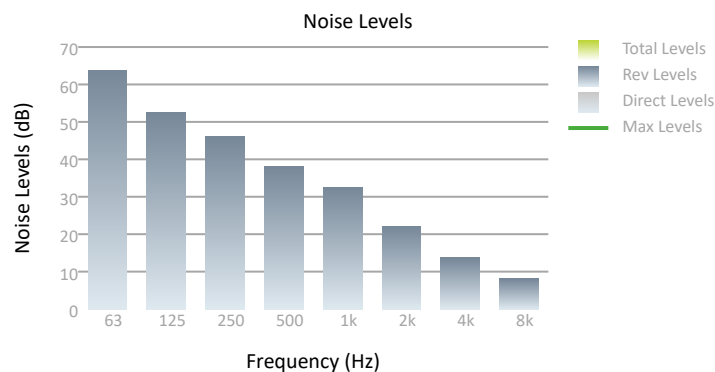
Volume (m³) 21.6



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Night)	1	44.7	33.6	27.1	19.4	14.5	8.2	6.2	6.0

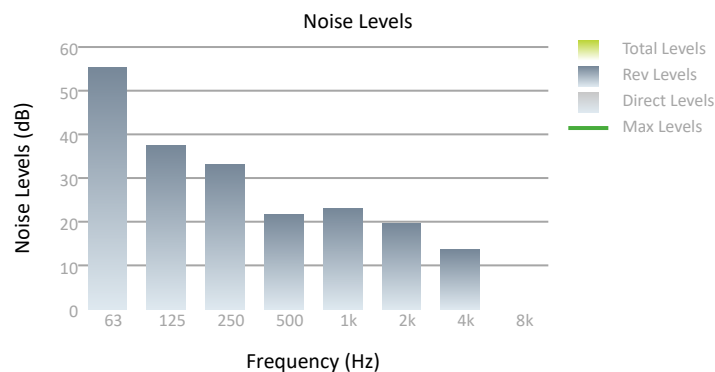
Reference	Bedroom 15 Night time LAfmax
Description	
Target Sound Level	-
Max Sound Level	-
Calculated Sound Level	43.2dB(A)
Calculated Tmf T60 (s)	0.4
Volume (m ³)	21.6



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Lmax, ff (Night)	1	63.7	52.6	46.1	38.1	32.6	22.1	13.7	8.0

Reference	Communal Living Area Daytime LAeq
Description	
Target Sound Level	-
Max Sound Level	-
Calculated Sound Level	32.2dB(A)
Calculated Tmf T60 (s)	0.48
Volume (m ³)	105.6



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	55.3	37.4	33.1	21.8	23.0	19.5	13.6	-

Calculation Sheet

Bedroom 22 Daytime LAeq

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Daytime Leq)										
Source dBA	62.0									
Octave Band Frequencies										
Leq,ff		66.0	64.0	60.0	58.0	58.0	54.0	49.0	43.0	Row A
Facade Wall Element										
		-45.1	-47.1	-49.1	-55.1	-61.1	-68.1	-67.1	-70.1	
Facade Glazed Element										
		-40.5	-52.5	-59.5	-65.5	-69.5	-76.5	-96.5	-98.5	
Facade Roof Element										
		-34.7	-54.7	-59.7	-64.7	-67.7	-64.7	-78.7	-80.7	
Ventilators										
		-44.5	-43.5	-44.5	-50.5	-55.5	-63.5	-65.5	-68.5	
Cumulative Lp										
Result		32.9	22.7	17.1	9.6	5.4	0.9	0.2	0.0	
ISO 12354-3 Lfs Correction										
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Room Corrections										
		11.6	11.2	10.4	10.4	9.8	9.3	8.6	8.6	
Internal Receiver Noise										
Internal Receiver Noise - Bedroom 22										
Daytime LAeq										
Reverberant Field, LPrev:		44.5	33.9	27.5	19.9	15.2	10.2	8.8	8.6	

Calculation Sheet

Bedroom 22 Nighttime LAeq

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Nighttime Leq)										
Source dBA	60.0									
Octave Band Frequencies										
Leq,ff		64.0	62.0	58.0	56.0	56.0	52.0	47.0	41.0	Row A
Facade Wall Element										
		-45.1	-47.1	-49.1	-55.1	-61.1	-68.1	-67.1	-70.1	
Facade Glazed Element										
		-40.5	-52.5	-59.5	-65.5	-69.5	-76.5	-96.5	-98.5	
Facade Roof Element										
		-34.7	-54.7	-59.7	-64.7	-67.7	-64.7	-78.7	-80.7	
Ventilators										
		-44.5	-43.5	-44.5	-50.5	-55.5	-63.5	-65.5	-68.5	
Cumulative Lp										
Result		30.9	20.7	15.2	7.8	4.1	0.6	0.1	0.0	
ISO 12354-3 Lfs Correction										
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Room Corrections										
		11.6	11.2	10.4	10.4	9.8	9.3	8.6	8.6	
Internal Receiver Noise										
Internal Receiver Noise - Bedroom 22										
Nighttime LAeq										
Reverberant Field, LPrev:		42.5	31.9	25.5	18.2	13.9	9.9	8.7	8.6	

Calculation Sheet

Bedroom 22 Nighttime LAfmax

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime Lmax)									
Source dBA	79.0								
Octave Band Frequencies									
Leq,ff		83.0	81.0	77.0	75.0	75.0	71.0	66.0	60.0
		Row A							
Facade Wall Element									
		-45.1	-47.1	-49.1	-55.1	-61.1	-68.1	-67.1	-70.1
Facade Glazed Element									
		-40.5	-52.5	-59.5	-65.5	-69.5	-76.5	-96.5	-98.5
Facade Roof Element									
		-34.7	-54.7	-59.7	-64.7	-67.7	-64.7	-78.7	-80.7
Ventilators									
		-44.5	-43.5	-44.5	-50.5	-55.5	-63.5	-65.5	-68.5
Cumulative Lp									
Result		49.9	39.7	34.0	26.1	20.9	11.2	4.7	1.0
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Room Corrections									
		11.6	11.2	10.4	10.4	9.8	9.3	8.6	8.6
Internal Receiver Noise									
Internal Receiver Noise - Bedroom 22									
Nighttime LAfmax									
Reverberant Field, LPrev:		61.5	50.9	44.4	36.4	30.8	20.5	13.3	9.6

Calculation Sheet

Bedroom 15 Daytime LAeq

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Daytime Leq)									
Source dBA	64.0								
Octave Band Frequencies									
Leq,ff		68.0	66.0	62.0	60.0	60.0	56.0	51.0	45.0
Row A									
Facade Wall Element									
		-46.9	-48.9	-50.9	-56.9	-62.9	-69.9	-68.9	-71.9
Facade Glazed Element									
		-39.6	-51.6	-58.6	-64.6	-68.6	-75.6	-95.6	-97.6
Facade Roof Element									
		-33.8	-53.8	-58.8	-63.8	-66.8	-63.8	-77.8	-79.8
Ventilators									
		-43.6	-42.6	-43.6	-49.6	-54.6	-62.6	-64.6	-67.6
Cumulative Lp									
Result		35.7	25.0	19.4	11.7	7.3	1.6	0.3	0.0
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Room Corrections									
		8.9	8.6	7.7	7.7	7.2	6.6	5.9	5.9
Internal Receiver Noise									
Internal Receiver Noise - Bedroom 15									
Daytime LAeq									
Reverberant Field, LPrev:		44.7	33.6	27.1	19.4	14.5	8.2	6.2	6.0

Calculation Sheet

Bedroom 15 Night time LAeq

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Nighttime Leq)										
Source dBA	64.0									
Octave Band Frequencies										
Leq,ff		68.0	66.0	62.0	60.0	60.0	56.0	51.0	45.0	Row A
Facade Wall Element										
		-46.9	-48.9	-50.9	-56.9	-62.9	-69.9	-68.9	-71.9	
Facade Glazed Element										
		-39.6	-51.6	-58.6	-64.6	-68.6	-75.6	-95.6	-97.6	
Facade Roof Element										
		-33.8	-53.8	-58.8	-63.8	-66.8	-63.8	-77.8	-79.8	
Ventilators										
		-43.6	-42.6	-43.6	-49.6	-54.6	-62.6	-64.6	-67.6	
Cumulative Lp										
Result		35.7	25.0	19.4	11.7	7.3	1.6	0.3	0.0	
ISO 12354-3 Lfs Correction										
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Room Corrections										
		8.9	8.6	7.7	7.7	7.2	6.6	5.9	5.9	
Internal Receiver Noise										
Internal Receiver Noise - Bedroom 15										
Night time LAeq										
Reverberant Field, LPrev:		44.7	33.6	27.1	19.4	14.5	8.2	6.2	6.0	

Calculation Sheet

Bedroom 15 Night time LAfmax

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime Lmax)									
Source dBA	83.0								
Octave Band Frequencies									
Leq,ff		87.0	85.0	81.0	79.0	79.0	75.0	70.0	64.0
		Row A							
Facade Wall Element									
		-46.9	-48.9	-50.9	-56.9	-62.9	-69.9	-68.9	-71.9
Facade Glazed Element									
		-39.6	-51.6	-58.6	-64.6	-68.6	-75.6	-95.6	-97.6
Facade Roof Element									
		-33.8	-53.8	-58.8	-63.8	-66.8	-63.8	-77.8	-79.8
Ventilators									
		-43.6	-42.6	-43.6	-49.6	-54.6	-62.6	-64.6	-67.6
Cumulative Lp									
Result		54.7	44.0	38.4	30.4	25.4	15.5	7.7	2.1
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Room Corrections									
		8.9	8.6	7.7	7.7	7.2	6.6	5.9	5.9
Internal Receiver Noise									
Internal Receiver Noise - Bedroom 15									
Night time LAfmax									
Reverberant Field, LPrev:		63.7	52.6	46.1	38.1	32.6	22.1	13.7	8.0

Calculation Sheet

Communal Living Area Daytime LAeq

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade									
Source dBA	64.0								
Octave Band Frequencies									
Leq,ff		68.0	66.0	62.0	60.0	60.0	56.0	51.0	45.0 Row A
Facade Wall Element									
		-52.8	-54.8	-56.8	-62.8	-68.8	-75.8	-74.8	-77.8
Facade Glazed Element									
		-36.8	-45.8	-53.8	-58.8	-63.8	-65.8	-77.8	-79.8
Facade Roof Element									
		-20.5	-37.5	-47.5	-53.5	-58.5	-59.5	-60.5	-
Ventilators									
		-41.9	-42.9	-35.9	-45.9	-43.9	-42.9	-43.9	-44.9
Cumulative Lp									
Result		47.6	30.1	26.5	15.2	16.4	13.4	8.0	-
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Room Corrections									
		7.7	7.3	6.6	6.6	6.6	6.1	5.6	-
Internal Receiver Noise									
Internal Receiver Noise - Communal									
Living Area Daytime LAeq									
Reverberant Field, LPrev:		55.3	37.4	33.1	21.8	23.0	19.5	13.6	-

Calculation Sheet

Bedroom 22 The Bread Shed Event Assessment Leq

	Octave Band Centre Frequency (Hz)								
	63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade									
Source sound level	78.0	63.0	60.0	60.0	58.0	52.0	44.0	39.0	Row A
Facade Wall Element									
	-45.1	-47.1	-49.1	-55.1	-61.1	-68.1	-67.1	-70.1	
Facade Glazed Element									
	-40.5	-52.5	-59.5	-65.5	-69.5	-76.5	-96.5	-98.5	
Facade Roof Element									
	-34.7	-54.7	-59.7	-64.7	-67.7	-64.7	-78.7	-80.7	
Ventilators									
	-44.5	-43.5	-44.5	-50.5	-55.5	-63.5	-65.5	-68.5	
Cumulative Lp									
Result	44.9	21.7	17.1	11.4	5.4	0.6	0.1	0.0	
ISO 12354-3 Lfs Correction									
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Room Corrections									
	11.6	11.2	10.4	10.4	9.8	9.3	8.6	8.6	
Internal Receiver Noise									
Internal Receiver Noise - Bedroom 22									
The Bread Shed Event Assessment Leq									
Reverberant Field, LPrev:	56.5	32.9	27.5	21.7	15.2	9.9	8.6	8.6	