

Noise impact assessment to a proposed residential development

Bennet Court, Bennet Road, Reading



Client: Ultima Properties Limited

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CONTENTS

1. SUMMARY	2
2. INTRODUCTION	3
3. ACOUSTIC CRITERIA & ASSESSMENT METHODOLOGY	3
3.1. The Town and Country Planning (General Permitted Development) (England) (Amendment) Order 3	
3.2. National Planning Policy Framework (NPPF) and Noise Policy Statement for England (NPSE) ...	3
3.3. Planning Practice Guidance – Noise (PPG-N)	5
3.4. British Standard 8233:2014	7
3.5. British Standard 4142:2014+A1:2019	8
4. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS	9
5. SOUND LEVEL SURVEYS.....	9
6. ASSESSMENT OF COMMERCIAL NOISE	14
7. ACOUSTIC DESIGN PROCESS AND NOISE MITIGATION SCHEME	17
8. ASSESSMENT OF FAÇADE SOUND INSULATION	19
9. CONCLUSION.....	20
Appendix A.....	A

1. SUMMARY

- 1.1. The client is preparing an application for the Prior Approval change of use to Class C3 dwelling houses at Bennet Court, Bennet Road, Reading.
- 1.2. ACA Acoustics Limited have been commissioned to assess acoustic impacts to the proposed new residential development.
- 1.3. A sound level survey to the southern, and western facades of the buildings, along with manned measurements to the north-east, and other locations in the surrounding areas has been carried out between the 15th and 17th of December 2020.
- 1.4. Whilst on site the author subjectively considered that levels to the southern facade of the site are primarily dominated by mechanical services equipment serving the Smith News loading bay, along with forklift activity from the Arnold Laver Reading timberyard. There were low levels of activity from the Renault Trucks South unit to the western façade while the author was on site, however the unmanned sound level survey indicates that levels from the unit are clearly audible during periods of activity. To the north and eastern facades, a combination of industrial vehicular activity from the Select Environmental Services depot, and mechanical noise from louvres within the western façade of Rico Couriers Reading can be heard. The site currently consists of offices.
- 1.5. The impact of industrial and commercial noise sources has been assessed in accordance with BS 4142:2014+A1:2019. This indicates that without mitigation there is potential for significant adverse impacts on future residents. A good acoustic design process has been followed to mitigate this impact and ensure a very high standard of amenity to the proposed apartments.
- 1.6. A scheme for sound insulation of the building envelope has been developed such that internal sound levels due to commercial sources are at least 6dBA better than the guideline limits for a good standard of amenity to living rooms and bedrooms set out in BS 8233:2014. Details of the sound insulation scheme are provided within this report.
- 1.7. It is the author's opinion that, allowing for the comprehensive mitigation scheme set out in this report, internal sound levels within the proposed residential flats will not be detrimental to the amenity of future occupants. No further noise mitigation measures shall be necessary to comply with the requirements of The Town and Country Planning (General Permitted Development) (England) (Amendment) Order and the site is suitable for residential development.

2. INTRODUCTION

The client is preparing an application to Reading Borough Council for the Prior Approval change of use to Class C3 dwelling houses at Bennet Court, Bennet Road, Reading.

ACA Acoustics Limited has been commissioned by Pegasus Planning Group Limited on behalf of Ultima Properties Limited to carry out an assessment of potential acoustic impacts to the proposed residential development.

This report presents results of the sound level and subjective observation surveys, assessment of results in accordance with BS 4142:2014+A1:2019, and a scheme for sound insulation such that suitable internal sound levels are achieved.

3. ACOUSTIC CRITERIA & ASSESSMENT METHODOLOGY

3.1. The Town and Country Planning (General Permitted Development) (England) (Amendment) Order

An application for Prior Approval is to be made under The Town and Country Planning (General Permitted Development) (England) (Amendment) Order, Class O (GPDO). In accordance with paragraph 7.(1)(c) of the Order,

“development under Class O is permitted subject to the condition that before beginning the development, the developer must apply to the local planning authority for a determination as to whether the prior approval of the authority will be required as to ... (d) impacts of noise from commercial premises on the intended occupiers of the development”.

It is important to consider the GPDO specifically refers to noise from commercial premises to the proposed development. Noise from other sources including traffic on nearby routes is not considered under the GPDO.

The Order does not include any assessment methodology nor criteria to be achieved and therefore it is relevant to consider guidance provided in relevant British Standards and other documents.

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

The current revision of the National Planning Policy Framework (referred to as NPPF) was published in February 2019. The 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 170 of the NPPF states that,

“planning policies and decisions should contribute to and enhance the natural and local environment by ... 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 180 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.”*

Paragraph 182 introduces the concept of the ‘agent of change’. This requires,

“Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed”.

New development must be designed to fully integrate with existing businesses and community uses and the burden on achieving suitable sound levels falls on the new developer.

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 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 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 180 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, 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 to the development.

3.3. Planning Practice Guidance – Noise (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;

“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 provides outline guidance on the definition of 'significant adverse effect' and 'adverse effect'. 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 descriptive definitions for the NOEL, LOAEL and SOAEL, as with the NPPF and NPSE there are no numerical values provided.

3.4. British Standard 8233:2014

The introduction to BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* confirms that,

“this guide suggests criteria, such as suitable sleeping/resting conditions, and proposes noise levels that normally satisfy these criteria.”

Guidance limits for internal sound levels within living rooms and bedrooms, taken from Table 4 of BS 8233:2014, are shown in Table 1 below:

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

Table 1: BS 8233:2014 indoor ambient sound levels for dwellings

The above criteria are generally considered suitable for noise from traffic and other ‘anonymous’ sources. However, Section 7.7.1 notes,

“Occupants are usually more tolerant of noise without a specific character than, for example, that from neighbours which can trigger complex emotional reactions. For simplicity, only noise without character is considered in Table 4... Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate”.

Noise from commercial and industrial sources in the vicinity would be defined as noise with specific character and lower criteria would be appropriate. There is little available guidance on acceptable sound levels inside dwellings due to external commercial and industrial noise, and it is therefore necessary to consider wider guidance which may be similar and applicable.

The Association of Noise Consultants published *Acoustics Ventilation and Overheating – Residential Design Guide* in January 2020. This includes recommendations for suitable internal sound levels where mechanical ventilation is proposed. Guidance within the document confirms that it is desirable for noise from mechanical ventilation systems to not exceed a level of LAeq 30dB in living rooms and LAeq 24dB-26dB in bedrooms. The scheme for façade sound insulation on this development includes mechanical ventilation which would be designed to these limits.

In addition, ACA Acoustics therefore recommends that façade break-in levels from nearby industrial and commercial sources are also designed to not exceed a level of **L_{Aeq} 30dB** during the daytime and **L_{Aeq} 24dB** at night. These are equivalent to noise that will occur from the mechanical ventilation systems and so the noise intrusion will not be noticeable above the internal residual sound level and the cumulative levels from façade break-in and internal mechanical equipment together will remain below guideline values as set out within BS 8233:2014. The resultant internal acoustic environment will not be disrupting to future occupants.

3.5. British Standard 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. Section 11 of BS 4142:2014+A1:2019 provides a commentary of the assessment result, to,

“Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9).

- a) Typically, the greater this difference, the greater the magnitude of the impact;*
- b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context;*
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

It is important to consider however, that BS 4142:2014+A1:2019 specifically confirms that this commentary provides only an initial indicative conclusion and is dependent on the context of the assessment, which may materially alter the assessment result.

Section 11 discusses factors which should be taken into consideration when reviewing the context. These include,

“The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already 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”.*

Discussion of pertinent factors associated with this development are included in this report.

4. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The development site is at Bennet Court, Bennet Road, Reading. The site is currently of commercial offices over ground and first-floor level.

To the southern façade of the site is the Smith News Loading bay. This was witnessed as being quiet during the day, however loading events occurred during the early morning. To the east of the site diesel forklift activity within the Arnold Laver Reading timberyard is clearly audible during daytime hours.

To the west is the Renault Trucks South garage. Levels from maintenance work were not witnessed while the author was on site, however clear peaks in the unmanned sound level survey indicate it is a dominant noise source at times while maintenance works are ongoing. North and east of the site includes a combination of vehicular activity from the Select Environmental Services depot, and mechanical noise from louvres within the western façade of Rico Couriers Reading.

Drawings and details of the proposed development are not yet available however assessment has been undertaken based on nominal anticipated room layouts.

5. SOUND LEVEL SURVEYS

To assess the impact of existing noise sources, sound level surveys have been conducted at the development site. Details of the surveys carried out by ACA Acoustics are provided below.

Surveys were carried out over nominally a 3-day period between the 15th and 17th December 2020.

Two measurement positions were used, to the south and western façades. Additional measurements were undertaken at various positions while on site during the setting up and retrieving of the unattended surveys.

A printout from Google Maps identifying the measurement positions is included below.



Figure 2: Site location plan showing measurement positions

Sound levels were recorded in consecutive 15-minute samples of overall LAeq, LAfmax, and LA90 values along with other statistical indices. During visits to site to set up and collect the monitoring equipment ACA Acoustics' consultant spent time on site undertaking subjective observations of the acoustic climate and audible sources.

Weather conditions at the time of setting up the unmanned surveys were warm with light winds. Meteorological conditions were appropriate for acoustic measurements.

The following equipment was used during the surveys; the sound level meters were calibrated before the survey and checked after with no deviation noted.

Equipment	Serial Number
NTi Audio Class 1 sound level meter type XL2 complete with weatherproof and lockable outdoor environmental kit	A2A-06294-E0
Svantek Class 1 sound level meter type SV 307	84914
NTi Audio Class 1 sound level meter type XL2-TA	A2A-16877-E0
Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003 (Calibrated to a reference traceable to NIST)	83826

Table 2: Equipment used for the sound level survey

Results of the measurement surveys are shown in graphical form below.

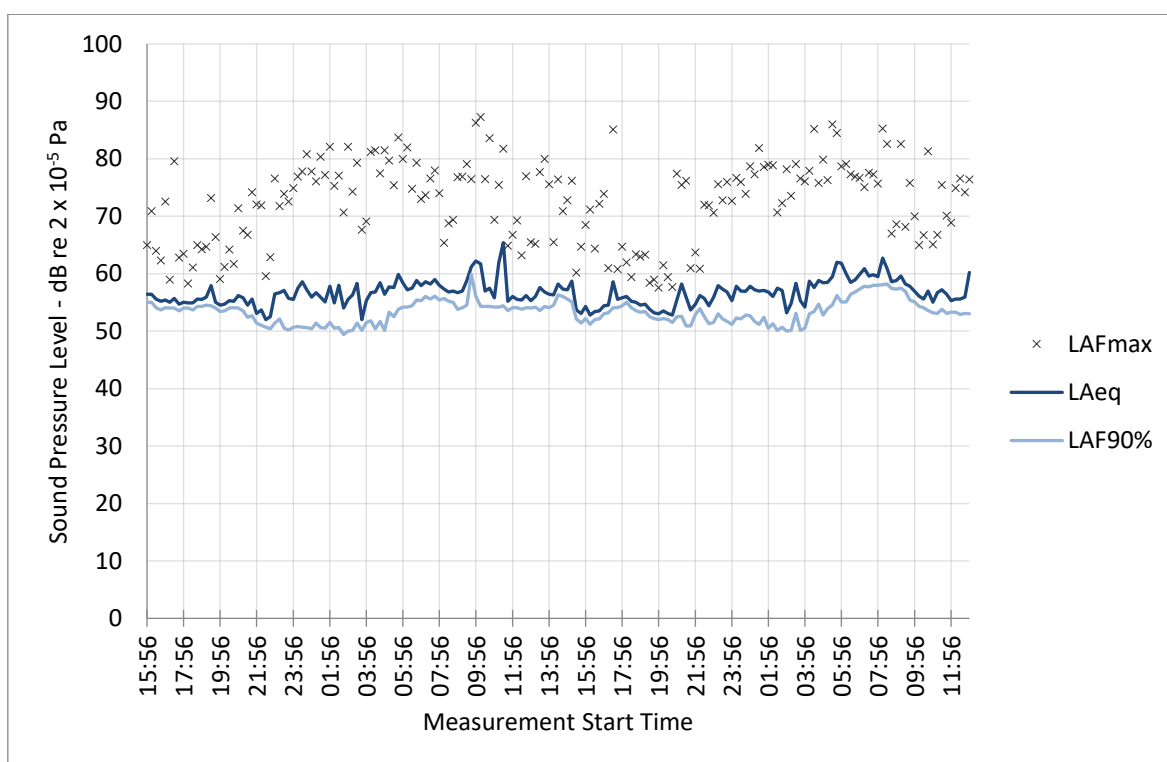


Figure 3: Sound level survey results at Position 1 (south façade)

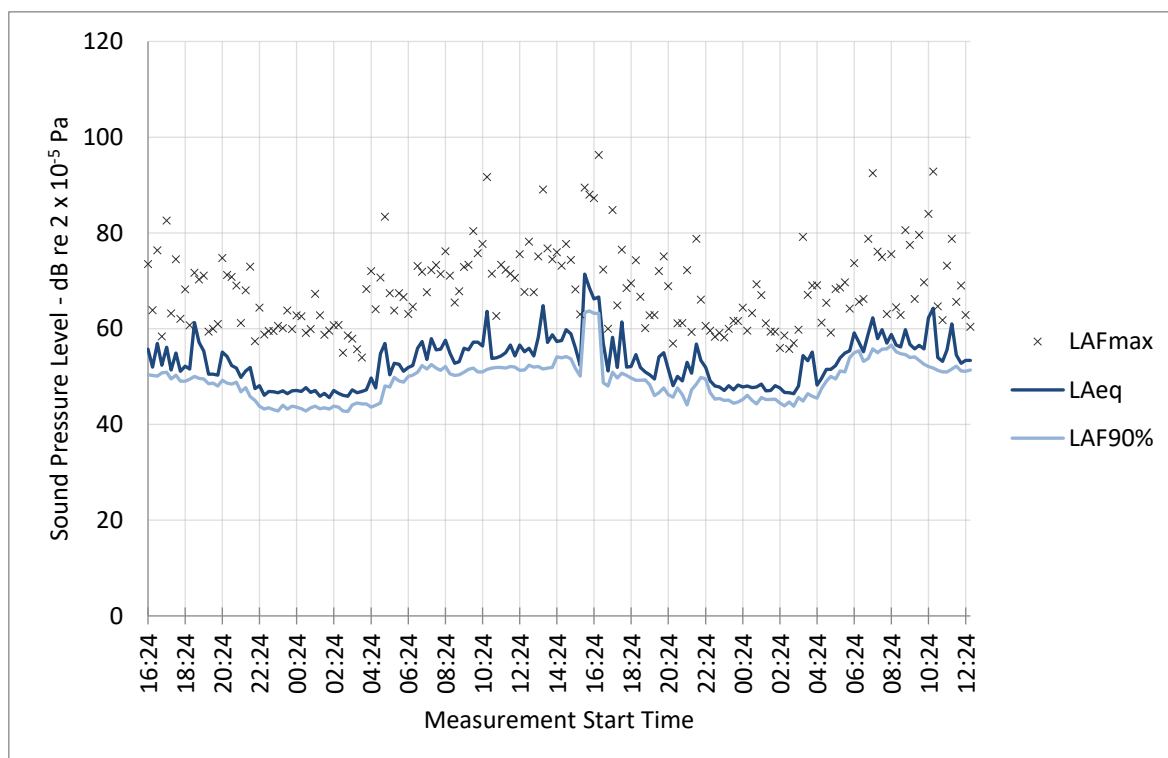


Figure 4: Sound level survey results at Position 2 (west façade)

Summary sound level survey results are shown in tabular form below.

Date	Daytime (07:00 – 23:00)	Night-Time (23:00 – 07:00)
	LAeq	LAeq
Tuesday 15 th December 2020	55dB	57dB
Wednesday 16 th December 2020	57dB	58dB
Thursday 17 th December 2020	58dB	-
Average over survey	57dB	58dB

Table 3: Summary sound level survey results at Position 1 (south façade)

Date	Daytime (07:00 – 23:00)	Night-Time (23:00 – 07:00)
	LAeq	LAeq
Tuesday 15 th December 2020	54dB	50dB
Wednesday 16 th December 2020	59dB	52dB
Thursday 17 th December 2020	58dB	-
Average over survey	58dB	51dB

Table 4: Summary sound level survey results at Position 2 (west façade)

Following the sound level surveys and subjective observations on site it is confirmed that industrial/commercial noise is subjectively audible from surrounding nearby units, and therefore an assessment in accordance with BS 4142:2014+A1:2019 is appropriate.

In accordance with BS 4142:2014+A1:2019 the prevailing background sound level is not necessarily taken to be the lowest recorded values, but rather the level that best represents the typical background sound level in the area over a defined period.

To the south façade a fan was running consistently. This can be seen within the graph of Figure 3 where levels overnight remain at or above LA90 50dB. Influence of the fan can also be seen in the survey results to the west façade, however due to the increased screening provided by the development building, then it is possible to obtain a likely representative background sound level for the area. Levels of a commercial and industrial nature at the west façade are primarily from the Renault Truck South, from which levels were witnessed as being intermittent.

Distribution of the measured LA90 sound levels to the west facade is shown below. The graph shows levels while the Renault unit was closed overnight.

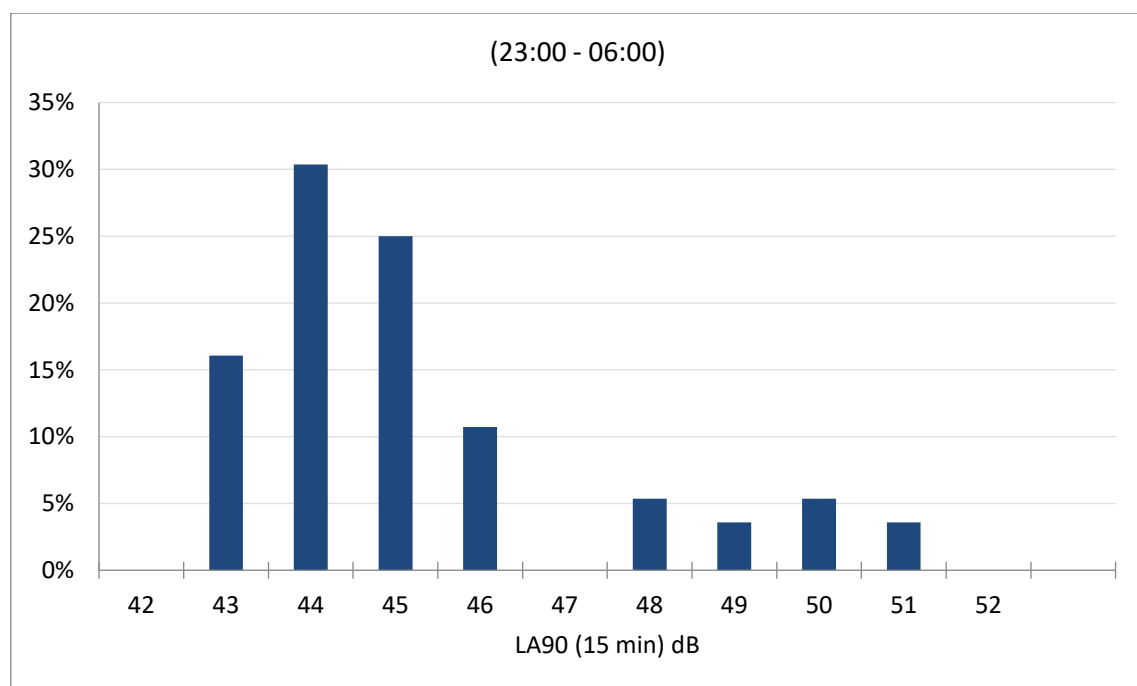


Figure 5: Statistical analysis of LA90 distribution overlooking Renault Truck South

Figure 5 shows that during early morning periods the background sound levels to the west facade are at a level of LA90 44dB or higher for at least 94% of the time. This level is also considered to be representative of levels to the south façade without industrial and commercial noise overnight.

During daytime periods, background sound levels to the south façade were not available, due to the constantly running equipment. However, due to the screening provided by the Bennet Court and Smiths News, from which the industrial noise was understood to originate, levels measured at

the west façade provide a suitable alternative for background sound levels in the area. This is shown in Figure 6 below. Measured background sound levels of LA90 52dB are exceeded for around 91% of the assessment period and are therefore considered representative of the area.

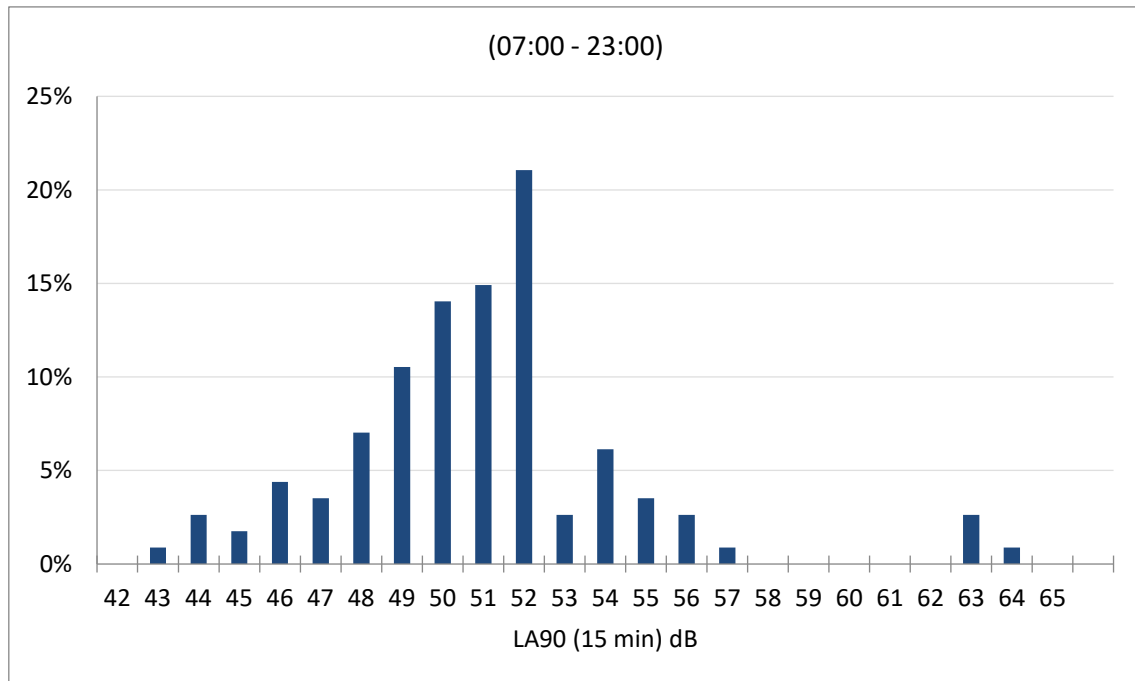


Figure 6: Statistical analysis of LA90 distribution overlooking Renault Truck South during daytime periods

Levels measured at the west façade also provide a residual sound level, taken from periods when the Renault Trucks unit was not operating. This has been taken between peaks of activity during the daytime as seen within Figure 4 above.

6. ASSESSMENT OF COMMERCIAL NOISE

Assessment of noise emissions from the equipment in the area are shown in Table 5 below.

Description	Daytime Assessment	Night-time Assessment	Relevant Clause	Commentary
Existing ambient level at south facade	LAeq 57dB	LAeq 58dB	7.3.2	Typical level
Existing residual level	LAeq 53dB	LAeq 51dB	7.3.3	Measured as detailed above
Specific level	LAeq 55dB	LAeq 57dB		Logarithmic subtraction of residual level from ambient level.
Background sound level	LA90 52dB	LA90 44dB	8.3	Representative background sound level
Acoustic feature correction	+6dB	+6dB	9.2	Levels at the southern façade include continuously running mechanical equipment, along with levels from loading from Smiths News during the night and forklifts at timber yards during the day nearby. Therefore, in accordance with Section 9.2 a correction of +3dB is applied for impulsivity, and +3 dB is applied for intermittency to account for these adverse characteristics.
Rating level	LAr 61dB	LAr 63dB	9.2	
Excess of rating level over background sound level	+9dB	+19dB	11	Assessment indicates likelihood of significant adverse impact depending on the context

Table 5: BS 4142:2014+A1:2019 assessment of commercial noise sources at Position 1 (southern façade)

Description	Daytime Assessment	Night-time Assessment	Relevant Clause	Commentary
Existing ambient level at west facade	LAeq 58dB	LAeq 51dB	7.3.2	Typical level
Existing residual level	LAeq 53dB	LAeq 51dB	7.3.3	Measured as detailed above
Specific level	LAeq 56dB	LAeq ≤41dB		Logarithmic subtraction of residual level from ambient level.
Background sound level	LA90 52dB	LA90 44dB	8.3	Representative background sound level
Acoustic feature correction	+6dB	+6dB	9.2	Levels at the Western façade include levels from the Renault Truck Garage, incorporating metal being struck, and power tools being used. Therefore, in accordance with Section 9.2 a correction of +3dB is applied for impulsivity, and +3 dB is applied for intermittency to account for these adverse characteristics.
Rating level	LAr 62dB	LAr 7dB	9.2	
Excess of rating level over background sound level	+10dB	+3dB	11	Assessment indicates likelihood of significant adverse impact during the daytime and potential adverse impact at night, depending on the context

Table 6: BS 4142:2014+A1:2019 assessment of commercial noise sources at Position 2 (western façade)

Levels to the eastern and northern facades also consist of industrial and commercial noise, albeit at lower levels of impact to those shown above. During lulls in traffic on Bennet Road, noise from louvres of Rico Couriers Reading are audible to the eastern façade and industrial vehicular activity from the Select Environmental Services depot are subjectively audible to the northern facade. Long term measurement and assessment of these sources were not made however this does not alter the initial outcome of the BS 4142:2014+A1:2019 assessment.

The initial outcome of a BS 4142:2014+A1:2019 assessment of the nearby commercial noise sources is that, without mitigation, there is a likelihood of significant adverse impact, depending on the context.

The context of this assessment is the development of new residential properties to an area of existing commercial use. In the author's experience the likelihood of adverse impact may be slightly reduced in this context compared to the reverse situation of bringing a new noise-generating use to an existing residential dwelling. In situations where a new noise source is introduced residents notice a change in the acoustic climate potentially causing a reduction of amenity. However, in this instance residents moving into the new residential flats would not be conditioned to any pre-existing lower levels.

Considering the specific sound levels as numerical values, commercial noise incident on the façade of the new dwellings will be up to LAeq 56dB during the daytime and LAeq 57dB at night. Allowing for a loss of 15dBA through partially open windows, as recommended in BS 8233:2014, equates to an internal sound level within rooms of the new dwellings with open windows of 41dBA during the day and 42dBA at night. These exceed the BS 8233:2014 guideline limits shown in Table 1 above.

Excess above guideline sound level limits in conjunction with the rating level excess of up to +19dB above the background sound level indicates that without mitigation measures there is potential for adverse impact.

7. ACOUSTIC DESIGN PROCESS AND NOISE MITIGATION SCHEME

Section 11 of BS 4142:2014+A1:2019 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.*

These form the basis of a good acoustic design process. ProPG: Planning & Noise sets out a range of options which an acoustic consultant may consider ensuring a good acoustic design process has been followed. These matters are discussed in Table 7 below.

Principle	Discussion
Quietenning, relocating, or removing the source of noise	The noise sources are outside of the boundary of the site and outside of our client's ownership. Therefore, any mitigation measures to this are outside of our client's control and could not be enforced. It is therefore not practical to reduce sound levels from the sources in this instance.
Consider options for planning the site or building layout	The development building is existing and therefore consideration of the site layout is not relevant to this application.
Consider the orientation of proposed buildings	The development is of apartments within a single building. It is anticipated that flats will often be single aspect and therefore it is not practical to change the orientation, such as moving habitable rooms away from the noise source.
Improve the sound insulation of the building envelope	ACA Acoustics have proposed a high-performance scheme of façade sound insulation to ensure that sound levels inside rooms of the new apartments are at least 6dBA better than guideline limits set out in BS 8233:2014. Acoustic modelling of the site indicates that levels from industrial sources are audible at all facades, and therefore to ensure a high standard of amenity for future occupants it is recommended that the glazing and ventilation strategies proposed are continued throughout the building. Details of the sound insulation scheme are set out in Section 8 of this report.
Assess the viability of alternative solutions	ACA Acoustics have considered alternative solutions throughout 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. Through developing this acoustic design process and the supporting evidence we have considered best practice to reduce or control foreseeable risks. However, it is recommended that other relevant third parties, including the Principle Designer, consider all non-acoustic aspects of the design accordingly.

Table 7: Acoustic Design Statement details

8. ASSESSMENT OF FAÇADE SOUND INSULATION

A scheme for sound insulation is necessary to ensure a good standard of amenity inside rooms of the new residential apartments and that external noise intrusion from commercial sources do not exceed guideline levels as recommended within Section 3.4 above.

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

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	52	48	Existing cavity masonry wall construction.
Roof	59	52	Existing profiled steel roofing. New ceiling formed from two layers 12.5mm Gyproc WallBoard on MF system with acoustic hangers forming a cavity of 800mm with 100mm rockwool in the cavity.
Windows and glazed doors to habitable rooms	37	33	High performance acoustic double glazing with asymmetric and laminated inner pane such as Rationel's Aura Plus 4-18-8.52 or equivalent.

Table 8: Acoustic performance of facade elements

Note that constructions provided are typical and variations would be acceptable, so long as the installed construction achieved the specified sound insulation performance.

Where doors and windows are fitted within the external façade to habitable rooms, the minimum Rw performance stated within Table 8 is for the complete unit, including sound transmission paths through the frame and seals.

To ensure noise from external sources is not detrimental to the amenity of future occupants, it will be necessary to incorporate an acoustic ventilation scheme into the design such that residents can achieve adequate ventilation without necessarily needing to open windows.

It is recommended that the client provides a mechanical ventilation system such as MVHR or equivalent to habitable rooms of the proposed development. Suppliers including Titan, Vent Axia, or Nuaire would be able to offer suitable ventilation systems for residential purposes.

It is important that any self-noise (i.e. noise from the fans) and external noise intrusion through the ducted system must not cause internal sound levels to exceed the design requirements. As

discussed in Section 3.4 it is recommended that the overall noise from any mechanical ventilation system will need to be no higher than LAeq 24dB to bedrooms and LAeq 30dB in living rooms. These values should be considered a maximum and where possible lower limits achieved. Suitable MVHR systems must also incorporate summer bypass mode to minimise the potential for overheating during warmer periods.

Copy of acoustic calculations to example typical apartments are provided in Appendix A. Summary results are confirmed in Table 9 below and demonstrate that internal sound levels will comply with criteria in Section 3.4 of this report. Flats on the north and eastern façades will be screened from the primary noise sources and internal sound levels will therefore be lower than the worst-case facades calculated.

Room	Description	Calculated Internal Sound Level	Criteria
Living Room (South Façade)	Daytime LAeq	23dB	≤ 30dB
	Night-time LAeq	-	-
	Night-time LAfmax	-	-
Bedroom 1 (South Façade)	Daytime LAeq	22dB	≤ 30dB
	Night-time LAeq	23dB	≤ 24dB
	Night-time LAfmax	44dB	≤ 45dB
Living Room (West Façade)	Daytime LAeq	24dB	≤ 30dB
	Night-time LAeq	-	-
	Night-time LAfmax	-	-
Bedroom 1 (West Façade)	Daytime LAeq	23dB	≤ 30dB
	Night-time LAeq	18dB	≤ 24dB
	Night-time LAfmax	31dB	≤ 45dB

Table 9: Summary internal sound levels within sample apartment

Calculated sound levels in Table 9 demonstrate that a particularly good standard of amenity will be achieved for future occupants and no further mitigation is required. Cumulative façade break-in levels and levels from internal mechanical ventilation equipment will achieve recommended criteria as detailed within Section 3 of this report.

9. CONCLUSION

ACA Acoustics have been commissioned to provide a noise impact assessment at Bennet Court, Bennet Road, Reading. The assessment is to be submitted in support of an application for permitted development.

ACA Acoustics have undertaken various external sound level surveys, along with subjective listening and clarification of the acoustic environment. Noise from surrounding industrial and commercial sources are subjectively audible and occur over both day and night-time periods.

A scheme has been proposed such that suitable internal sound levels are achieved and there is an exceptionally low likelihood of adverse impact to future residents. The scheme includes specification for acoustic double glazing, and improvements to the internal ceiling, along with mechanical ventilation to the apartments.

In accordance with the requirements of the GPDO, BS 4142:2014+A1:2019, and BS 8233:2014, levels within residential rooms will not be disturbing to the amenity of occupants, and the author considers that the site is suitable for residential development.

Appendix A

Acoustic Calculations

Bennet Court, Bennet Road, Reading

Reference

Typical Livingroom Daytime LAeq South Facade

Description

Target Sound Level

35dB(A)

Max Sound Level

40dB(A)

Calculated Sound Level

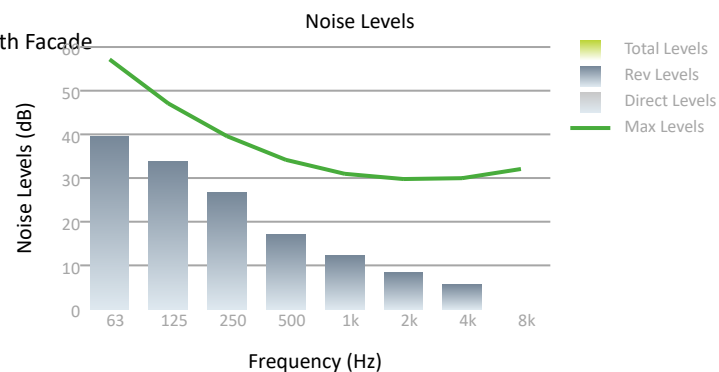
23dB(A)

Calculated Tmf T60 (s)

0.48

Volume (m³)

57.2



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	40	34	27	17	12	8	6	-

Calculation Sheet

Typical Livingroom Daytime LAeq South Facade

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade									
Source dBA	57.0								
Octave Band Frequencies									
Leq,ff		61.0	59.0	55.0	53.0	53.0	49.0	44.0	38.0
Row A									
Facade Wall Element									
		-44.4	-47.4	-51.4	-51.4	-60.4	-64.4	-66.4	-71.4
Facade Glazed Element									
		-31.2	-32.1	-34.1	-42.3	-47.8	-48.8	-49.7	-
Facade Roof Element									
		-31.2	-42.2	-52.2	-58.2	-62.2	-67.2	-63.2	-
Cumulative Lp									
Result		32.9	27.4	21.1	11.6	6.7	3.2	1.1	-
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Room Corrections									
		6.7	6.3	5.5	5.5	5.5	5.1	4.6	-
Internal Receiver Noise									
Internal Receiver Noise - Typical Livingroom Daytime LAeq South Facade									
Reverberant Field, L _{Prev}		39.6	33.8	26.6	17.2	12.2	8.3	5.7	-

Reference

Typical Bedroom Daytime LAeq South Facade

Description

Target Sound Level

35dB(A)

Max Sound Level

40dB(A)

Calculated Sound Level

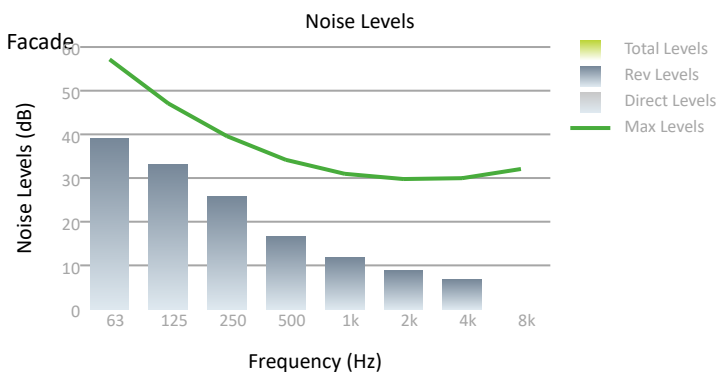
22dB(A)

Calculated Tmf T60 (s)

0.4

Volume (m³)

57.2



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	39	33	26	17	12	9	7	-

Calculation Sheet

Typical Bedroom Daytime LAeq South Facade

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Daytime Leq)										
Source dBA	57.0									
Octave Band Frequencies										
Leq,ff		61.0	59.0	55.0	53.0	53.0	49.0	44.0	38.0	Row A
Facade Wall Element										
		-44.2	-47.2	-51.2	-51.2	-60.2	-64.2	-66.2	-71.2	
Facade Glazed Element										
		-31.6	-32.5	-34.5	-42.7	-48.2	-49.2	-50.1	-	
Facade Roof Element										
		-31.2	-42.2	-52.2	-58.2	-62.2	-67.2	-63.2	-	
Cumulative Lp										
Result		32.7	27.1	20.7	11.6	7.3	4.8	3.5	-	
ISO 12354-3 Lfs Correction										
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	
Room Corrections										
		6.3	5.9	5.1	5.1	4.6	4.0	3.3	-	
Internal Receiver Noise										
Internal Receiver Noise - Typical Bedroom Daytime LAeq South Facade Reverberant Field, LPrev:										
		39.1	33.0	25.8	16.7	11.8	8.8	6.9	-	

Reference

Typical Bedroom Nighttime LAeq South Facade

Description

Target Sound Level

35dB(A)

Max Sound Level

40dB(A)

Calculated Sound Level

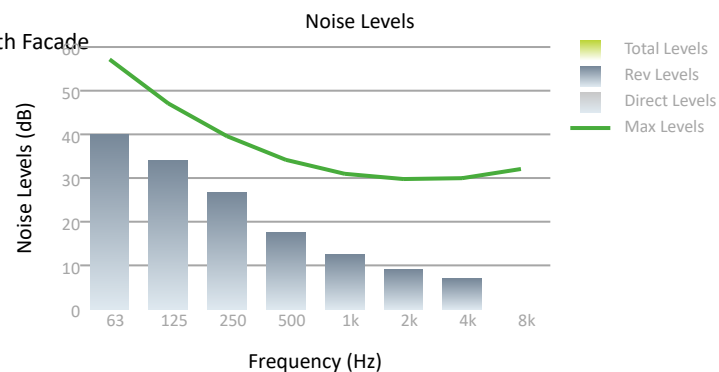
23dB(A)

Calculated Tmf T60 (s)

0.4

Volume (m³)

57.2



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Night)	1	40	34	27	18	12	9	7	-

Calculation Sheet

Typical Bedroom Nighttime LAeq South Facade

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime Leq)									
Source dBA	58.0								
Octave Band Frequencies									
Leq,ff		62.0	60.0	56.0	54.0	54.0	50.0	45.0	39.0
Facade Wall Element									
		-44.2	-47.2	-51.2	-51.2	-60.2	-64.2	-66.2	-71.2
Facade Glazed Element									
		-31.6	-32.5	-34.5	-42.7	-48.2	-49.2	-50.1	-
Facade Roof Element									
		-31.2	-42.2	-52.2	-58.2	-62.2	-67.2	-63.2	-
Cumulative Lp									
Result		33.7	28.1	21.7	12.5	7.9	5.1	3.7	-
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Room Corrections									
		6.3	5.9	5.1	5.1	4.6	4.0	3.3	-
Internal Receiver Noise									
Internal Receiver Noise - Typical Bedroom Nighttime LAeq South Facade									
Reverberant Field, L _{Prev}		40.1	34.0	26.8	17.6	12.5	9.1	7.0	-

Bennet Court, Bennet Road, Reading

Reference

Typical Bedroom Nighttime LAFmax South Façade

Description

Target Sound Level

45dB(A)

Max Sound Level

-

Calculated Sound Level

44dB(A)

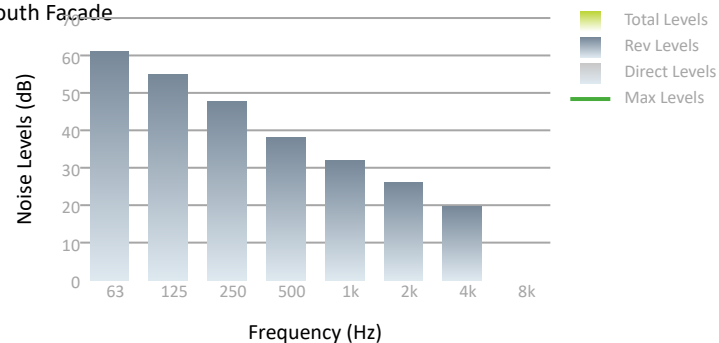
Calculated Tmf T60 (s)

0.4

Volume (m³)

57.2

Noise Levels



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Lmax, ff (Night)	1	61	55	48	38	32	26	20	-

Calculation Sheet

Typical Bedroom Nighttime L_Amax South Facade

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime L_{max})									
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									
		-44.2	-47.2	-51.2	-51.2	-60.2	-64.2	-66.2	-71.2
Facade Glazed Element									
		-31.6	-32.5	-34.5	-42.7	-48.2	-49.2	-50.1	-
Facade Roof Element									
		-31.2	-42.2	-52.2	-58.2	-62.2	-67.2	-63.2	-
Cumulative L_p									
Result		54.7	49.1	42.7	33.0	27.2	22.1	16.4	-
ISO 12354-3 L_fs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Room Corrections									
		6.3	5.9	5.1	5.1	4.6	4.0	3.3	-
Internal Receiver Noise									
Internal Receiver Noise - Typical Bedroom Nighttime L _A max South Facade									
Reverberant Field, L _{Prev} :		61.1	55.0	47.7	38.1	31.8	26.0	19.7	-

Reference

Typical Livingroom Daytime LAeq West Facade

Description

Target Sound Level

35dB(A)

Max Sound Level

40dB(A)

Calculated Sound Level

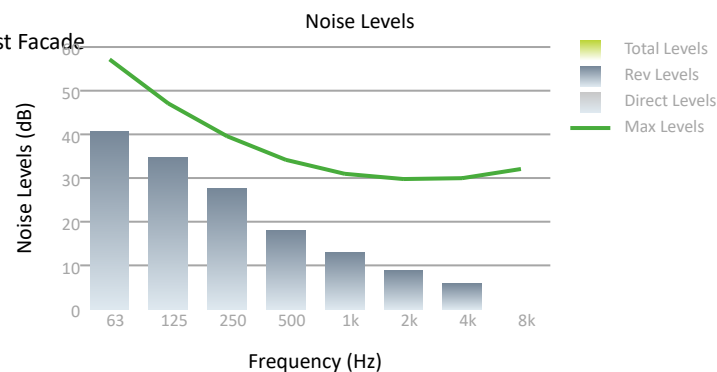
24dB(A)

Calculated Tmf T60 (s)

0.48

Volume (m³)

57.2



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	41	35	28	18	13	9	6	-

Calculation Sheet

Typical Livingroom Daytime LAeq West Facade

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade									
Source dBA	58.0								
Octave Band Frequencies									
Leq,ff		62.0	60.0	56.0	54.0	54.0	50.0	45.0	39.0
Row A									
Facade Wall Element									
		-44.4	-47.4	-51.4	-51.4	-60.4	-64.4	-66.4	-71.4
Facade Glazed Element									
		-31.2	-32.1	-34.1	-42.3	-47.8	-48.8	-49.7	-
Facade Roof Element									
		-31.2	-42.2	-52.2	-58.2	-62.2	-67.2	-63.2	-
Cumulative Lp									
Result		33.9	28.4	22.1	12.6	7.5	3.8	1.3	-
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Room Corrections									
		6.7	6.3	5.5	5.5	5.5	5.1	4.6	-
Internal Receiver Noise									
Internal Receiver Noise - Typical Livingroom Daytime LAeq West Facade Reverberant Field, LPrev:									
		40.6	34.8	27.6	18.1	13.0	8.8	5.9	-

Reference

Typical Bedroom Daytime LAeq West Facade

Description

Target Sound Level

35dB(A)

Max Sound Level

40dB(A)

Calculated Sound Level

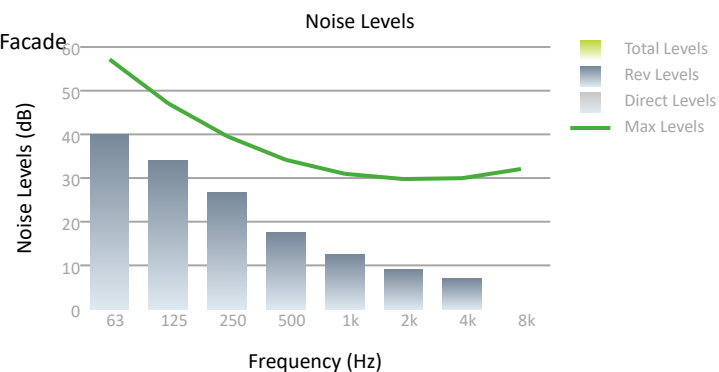
23dB(A)

Calculated Tmf T60 (s)

0.4

Volume (m³)

57.2



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	40	34	27	18	12	9	7	-

Calculation Sheet

Typical Bedroom Daytime LAeq West Facade

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Daytime Leq)									
Source dBA	58.0								
Octave Band Frequencies									
Leq,ff		62.0	60.0	56.0	54.0	54.0	50.0	45.0	39.0
Row A									
Facade Wall Element									
		-44.2	-47.2	-51.2	-51.2	-60.2	-64.2	-66.2	-71.2
Facade Glazed Element									
		-31.6	-32.5	-34.5	-42.7	-48.2	-49.2	-50.1	-
Facade Roof Element									
		-31.2	-42.2	-52.2	-58.2	-62.2	-67.2	-63.2	-
Cumulative Lp									
Result		33.7	28.1	21.7	12.5	7.9	5.1	3.7	-
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Room Corrections									
		6.3	5.9	5.1	5.1	4.6	4.0	3.3	-
Internal Receiver Noise									
Internal Receiver Noise - Typical Bedroom Daytime LAeq West Facade Reverberant Field, L _{Prev} :									
		40.1	34.0	26.8	17.6	12.5	9.1	7.0	-

Bennet Court, Bennet Road, Reading

Reference

Typical Bedroom Nighttime LAeq West Facade

Description

Target Sound Level

35dB(A)

Max Sound Level

40dB(A)

Calculated Sound Level

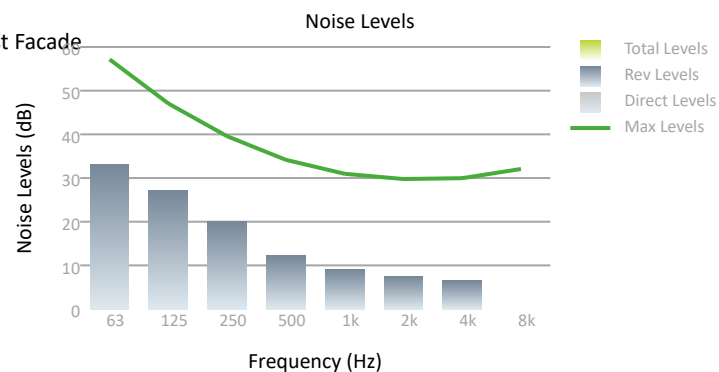
18dB(A)

Calculated Tmf T60 (s)

0.4

Volume (m³)

57.2



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Night)	1	33	27	20	12	9	8	6	-

Calculation Sheet

Typical Bedroom Nighttime LAeq West Facade

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Nighttime Leq)										
Source dBA	51.0									
Octave Band Frequencies										
Leq,ff		55.0	53.0	49.0	47.0	47.0	43.0	38.0	32.0	Row A
Facade Wall Element										
		-44.2	-47.2	-51.2	-51.2	-60.2	-64.2	-66.2	-71.2	
Facade Glazed Element										
		-31.6	-32.5	-34.5	-42.7	-48.2	-49.2	-50.1	-	
Facade Roof Element										
		-31.2	-42.2	-52.2	-58.2	-62.2	-67.2	-63.2	-	
Cumulative Lp										
Result		26.8	21.1	15.0	7.1	4.5	3.5	3.2	-	
ISO 12354-3 Lfs Correction										
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	
Room Corrections										
		6.3	5.9	5.1	5.1	4.6	4.0	3.3	-	
Internal Receiver Noise										
Internal Receiver Noise - Typical Bedroom Nighttime LAeq West Facade Reverberant Field, LPrev:										
		33.1	27.1	20.0	12.2	9.1	7.5	6.5	-	

Bennet Court, Bennet Road, Reading

Reference

Typical Bedroom Nighttime LAFmax West Façade

Description

Target Sound Level

45dB(A)

Max Sound Level

-

Calculated Sound Level

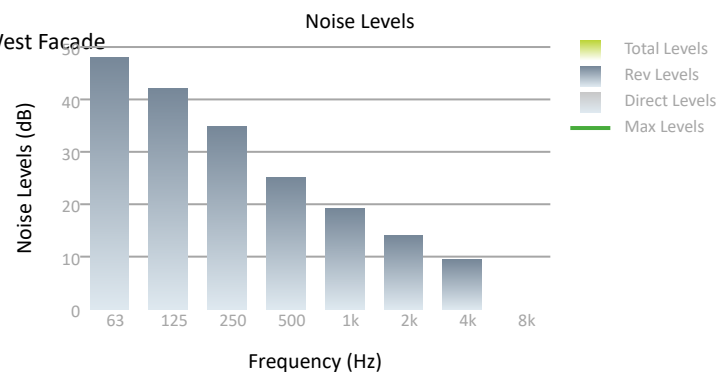
31dB(A)

Calculated Tmf T60 (s)

0.4

Volume (m³)

57.2



Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Lmax, ff (Night)	1	48	42	35	25	19	14	9	-

Calculation Sheet

Typical Bedroom Nighttime LAfmax West Facade

		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Sound Level at Facade (Nighttime Lmax)									
Source dBA	66.0								
Octave Band Frequencies									
Leq,ff		70.0	68.0	64.0	62.0	62.0	58.0	53.0	47.0
		Row A							
Facade Wall Element									
		-44.2	-47.2	-51.2	-51.2	-60.2	-64.2	-66.2	-71.2
Facade Glazed Element									
		-31.6	-32.5	-34.5	-42.7	-48.2	-49.2	-50.1	-
Facade Roof Element									
		-31.2	-42.2	-52.2	-58.2	-62.2	-67.2	-63.2	-
Cumulative Lp									
Result		41.7	36.1	29.7	20.1	14.5	10.0	6.1	-
ISO 12354-3 Lfs Correction									
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Room Corrections									
		6.3	5.9	5.1	5.1	4.6	4.0	3.3	-
Internal Receiver Noise									
Internal Receiver Noise - Typical Bedroom Nighttime LAfmax West Facade									
Reverberant Field, LPrev:		48.1	42.0	34.8	25.2	19.1	14.0	9.4	-