



CLEAR
ACOUSTIC DESIGN

Report

8a Shelley Road, Worthing

Environmental Noise
Assessment

Document History

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1.0 Introduction

1.1 Brief

Clear Acoustic Design has been appointed to conduct a noise assessment for a proposed residential development 8a Shelley Road, Worthing BN11 1TR.

The proposal is seen to be the development of a single residential dwelling in the existing building, which is undergoing a change of use from storage to residential.

A noise impact assessment has been requested in order to safeguard the internal noise levels of the proposal. An acoustic specification of the façade elements will be provided to ensure internal noise levels meet acceptable criteria.

The Local Authority has raised concerns regarding mechanical plant noise sources in proximity to the proposal. The rooms which are worst-affected by the noise sources are the upper bedrooms (1 and 2).

The noise impact assessment has been undertaken in line with BS 8233: 2014 *Guidance on Sound Insulation and Noise Reduction for Buildings*. NR20 has been used as a target for the internal noise levels. These criteria are seen to be appropriate in assessing and mitigating noise impact from this source.

1.2 Credentials

This report has been approved and issued by Stefan Hannan of Clear Acoustic Design. Stefan is a Company Director with 18 years of acoustic consulting experience. Stefan is also a full corporate member of the Institute of Acoustics (MIOA).

1.3 Glossary

The report is technical in nature. A supporting glossary of acoustic terms can be found in Appendix C.

2.0 Legislative and Policy Framework

2.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. The NPPF provides a framework within which local people and their council can produce their own distinctive local and neighbourhood plans. With explicit reference to noise, 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 ... noise pollution".

2.2 Noise Policy Statement for England (NPSE)

The NPPF refers to the Noise Policy Statement for England (NPSE), which applies to most forms of noise including environmental noise. The NPSE sets out the long-term vision of Government policy which is to "Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.". It aims that "Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on 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."

The use of the terms "significant adverse" and "adverse" are key phrases within the NPSE. The guidance establishes the concept of how the level of adverse effect on health and quality of life can be referenced including:

- NOEL – No Observed Effect Level - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

- LOAEL – Lowest Observed Adverse Effect Level - This is the level above which *adverse* effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level - This is the level above which *significant adverse* effects on health and quality of life occur.

Under the first aim of the NPSE (“avoid significant adverse impacts on health and quality of life”), an impact in line with SOAEL should be avoided. Under the second aim (“mitigate and minimise adverse impacts on health and quality of life”), where the impact lies somewhere between LOAEL and SOAEL, requiring that all reasonable steps are taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development, but does not mean that such adverse effects cannot occur.

2.3 Planning Practice Guidance on Noise (PPG-N)

The Planning Practice Guidance on Noise (PPG-N) is part of a suite of web-based guidance which is intended to support the implementation of the policies in the NPPF and the NPSE. It aids in expanding on the definitions from the NPSE of NOEL, LOAEL and SOAEL, by linking these terms to ‘examples of outcomes’, i.e. changes in behaviour and/or attitude to noise. The table below summarises the guidance from PPG-N in this regard.

Perception	Examples of outcomes	Increasing effect level	Action
NOEL - No Observed Effect Level ¹			
Not noticeable	No Effect	No Observed Adverse Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.		
LOAEL - Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up the 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
SOAEL - Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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 a change in the acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent
¹ This line is an assumption of the adverse effect level and is not explicitly referenced by PPG-N, though this appears to be a safe assumption.			

Table 2.1: Noise exposure hierarchy based on the likely average response – adapted from PPG-N

2.4 BS 8233: 2014

BS 8233: 2014 *Guidance on sound insulation and noise reduction for buildings* provides a range of internal noise level targets for many building types, typically for new residential buildings or buildings undergoing a change of use.

This British Standard is commonly used by planning authorities to place acoustic design targets on new residential developments near major sources of noise, such as transport networks. Design targets are based on the World Health Organisation (WHO) published guidelines.

The maximum nighttime noise level is based on WHO guidance but is not strictly part of the requirement of BS 8233: 2014.

The guideline for internal noise levels in residential buildings, taken from BS 8233: 2014, are shown in the table 2.2 below.

Activity	Location	Daytime (07:00-23:00)	Nighttime (23:00-07:00)
Resting	Living Room	35 dB $L_{Aeq,T}$	-
Dining	Dining Area	40 dB $L_{Aeq,T}$	-
Sleeping/Daytime Resting	Bedroom	35 dB $L_{Aeq,T}$	30 dB $L_{Aeq,T}$ / 45 dB L_{AFmax}

Table 2.2: Desired internal noise levels in residential buildings, from BS 8233: 2014

2.5 Local Authority Requirements

“The Environmental Health Officer has identified a potential noise source which may require further investigation from the sub-station and it has also been identified that there is a shop at the front that has a very noisy aircon unit. Both noise sources may have an impact on residential amenity for future occupants. Please can you therefore carry out a noise survey.”

The criteria set out in sections 2.1 to 2.5 of this report are deemed the most appropriate for conducting a noise assessment of this type.

2.6 Noise Rating (NR)

Noise Ratings serve as a standard way to measure and specify noise in buildings and occupied spaces. The single figure rating also takes into account the frequency content of the noise where BS 8233: 2014 does not. Noise Rating curves were developed by the International Organization for Standardization (ISO) to determine the acceptable indoor environment for hearing preservation.

Noise Rating	Application
NR 20	<i>A specific rating that helps determine if a noise level is acceptable for a bedroom during nighttime hours (23:00-07:00)</i>
NR 25	<i>Concert halls, broadcasting and recording studios, churches</i>
NR 30	<i>Private dwellings, hospitals, theatres, cinemas, conference rooms</i>
NR 35	<i>Libraries, museums, court rooms, schools, hospitals operating theatres and wards, flats, hotels, executive offices</i>
NR 40	<i>Halls, corridors, cloakrooms, restaurants, offices, shops</i>
NR 45	<i>Department stores, supermarkets, canteens, general offices</i>
NR 50	<i>Typing pools, offices with business machines</i>
NR 60	<i>Light engineering works</i>
NR 70	<i>Foundries, heavy engineering works</i>

Table 2.2: Noise Rating Curves - Applications

3.0 Environmental Noise Survey

3.1 Description of Site

An aerial view of the site can be seen below in figure 3.1. Full proposed plans can be seen in Appendix B.

The development will occupy the existing building, which is undergoing a renovation to create a single residential dwelling.

The site is located on Shelley Road, adjoining to the rear of the existing shop on Shelley Road.

Noise in this area is dominated by the condenser units attached to the shop on Shelley Road. When these units are on, they are clearly audible within the bedroom of the proposal.

There is a mix of road traffic noise Shelley Road, and other environmental noise from residential properties surrounding the site. This is deemed typical of similar areas and does not present an uncommon noise climate.

The substation to the north of the proposal was not seen to produce audible noise during our site visit, and internal noise measurements in the bedroom at the north of the building show reasonable low-frequency levels, conforming to NR20 as measured during the site visit. This source of noise was not seen to be dominant or audible.

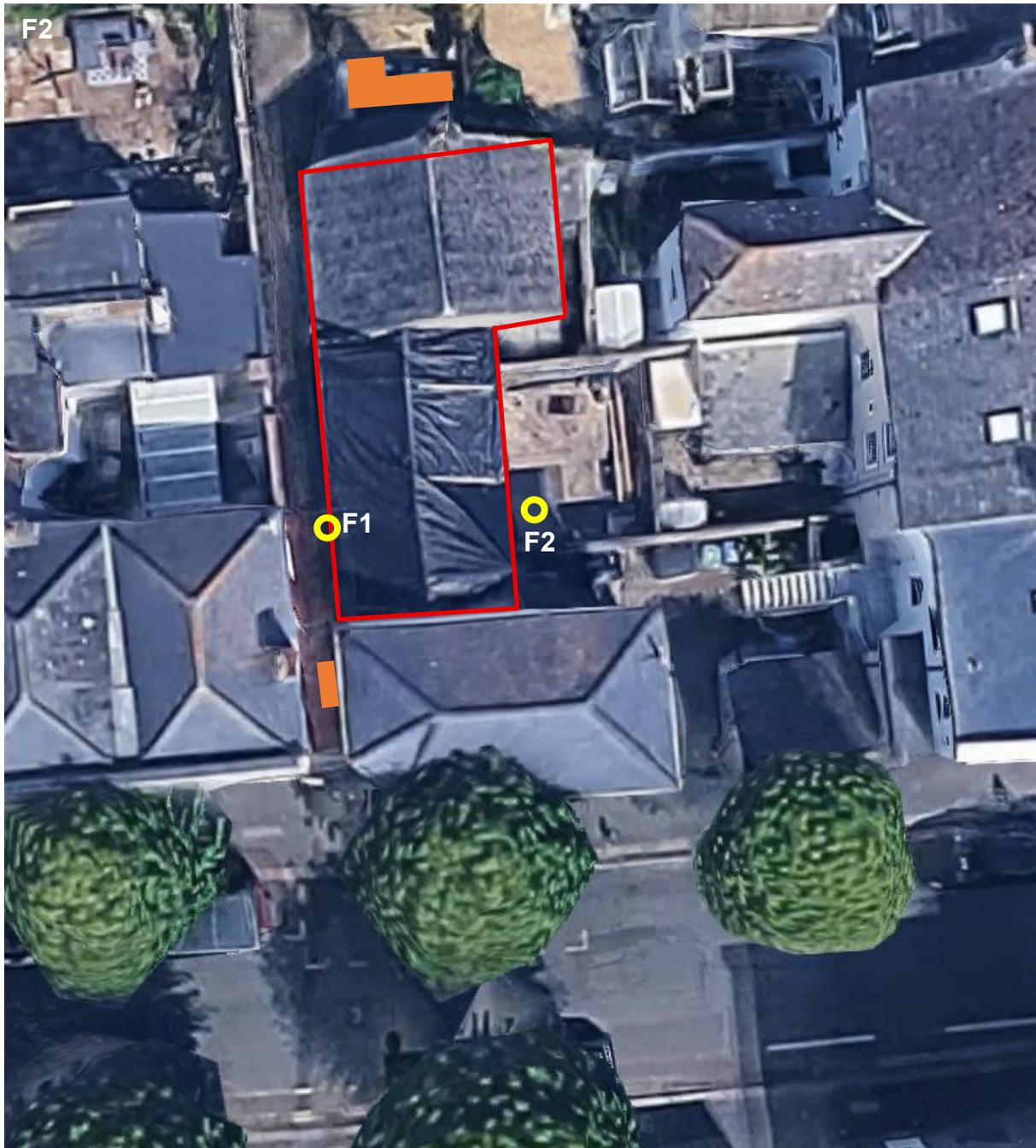


Figure 3.1 Aerial view of site with survey locations (F1, F2), Noise Sources (Orange, AC to south, sub-station to north)

3.2 Noise Monitoring Position

In order to understand the noise level affecting the proposal, Clear Acoustic Design have undertaken an environmental noise survey a location representative of the proposed façades of the new development.

Ambient noise levels were measured over a 24-hour period between 11/12/25 and 12/12/25 using a single fixed noise monitor (referred to as F1).

In addition to this, a short-term attended measurement was taken a position (known as F2) in order to determine the change in noise levels across the site.

The measurement positions are marked on figure 3.1 above. The sound level meter was extended on a pole from the upper rooflight window in the bedroom which is worst affected by existing mechanical plant. This position is deemed representative of the proposal.

Noise levels were seen to be significantly quieter in the front yard, due to being further from the existing mechanical plant units, and being acoustically screened by the building's structure.

Position F1 is therefore deemed to be representative of the worst-case scenario noise levels and should therefore provide a robust noise level for assessment which takes into account the dominant noise source (condenser units) and road/other environmental noise.

3.3 Measurement Equipment and Environmental Conditions

The weather was dry for the duration of the survey with a high of 12°C during the daytime period and a low of 10°C during the nighttime period.

Wind speeds were below 5m/s⁻¹ for the duration of the survey.

The conditions were seen to be good for conducting noise measurements.

The following noise measurement equipment as seen in table 3.2 was used for the survey.

Equipment	Serial Number	Calibration Date
Svantek SV 971A Type 1 Sound Level Meter	154269	22/07/24
Svantek SV 18A Preamplifier	154269	22/07/24
ACO 7152 Microphone	92781	16/07/24

Table 3.2 Measuring Equipment Used for Survey

3.4 Fixed Noise Monitoring Graph – F1

Figure 3.3 below provides a graph of the long-term measured noise levels at survey position F1. The ambient (L_{Aeq}) and background (L_{A90}) noise levels are shown. Measurements were taken over 1-minute intervals.

It can be seen in the data below that the condenser units are the dominant source of noise (the peaks shown in the measured data correspond to the operational duty periods of the condenser units).

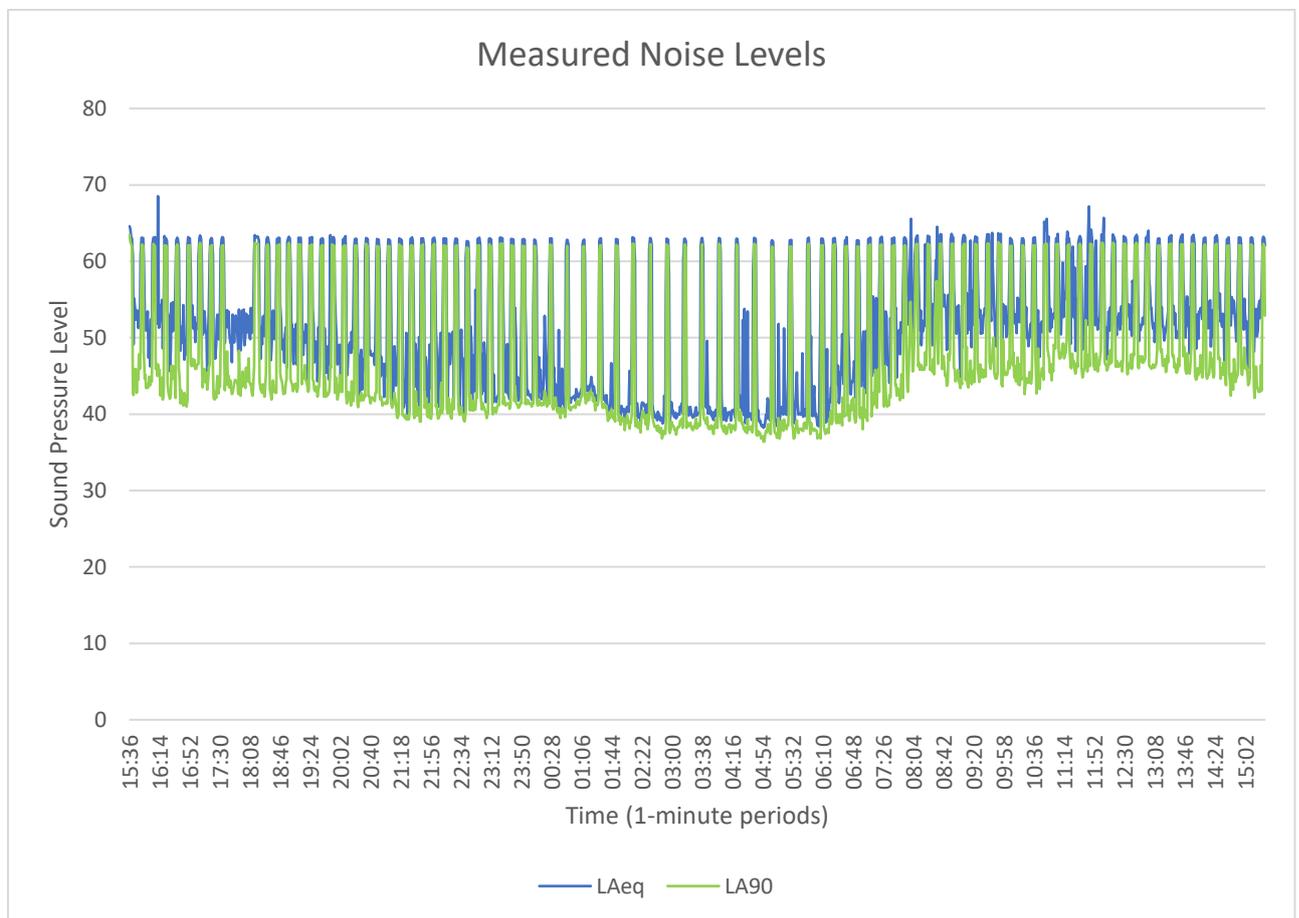


Figure 3.3 Long Term Measurement Graph – F1

3.5 Measured Noise Levels from Survey

To conduct an assessment in line with BS 8233: 2014, it is necessary to extrapolate the ambient (L_{Aeq}) and maximum (L_{AFmax}) noise levels from the survey data. The background (L_{A90}) level is also shown for context.

The representative maximum noise level (L_{AFmax}) has been determined by using the 11th highest maximum noise event in the night-time period, in line with World Health Organisation guidelines.

The daytime and night-time noise levels are presented in table 3.5 below.

Measurement Time Period	Assessment Ambient Noise Level, $L_{Aeq,T}$ dB	Assessment Background Noise Level, L_{A90} dB	Assessment Maximum Noise Level, L_{AFmax} dB
Day (07:00-23:00)	58	41	N/A
Night (23:00-07:00)	57	36	66

Table 3.5 Survey Noise Levels

4.0 Assessment to BS 8233: 2014 and Façade Specification

An acoustic specification of the façade elements to mitigate against the measured on-site noise levels is provided below.

This specification has been designed to provide NR20 within the upper bedrooms (1 and 2) of the dwelling, during the operational duty period of the condenser unit. NR20 is considered to provide suitably quiet internal conditions for a bedroom during the nighttime across the frequency spectrum. Bedrooms are more noise-sensitive room types than living rooms and dining areas, therefore only bedrooms have been specified with NR20 in mind.

It should be noted that calculations indicate that suitable internal conditions would not be met with open windows, meaning that a mechanical ventilation strategy may be required for the upper bedrooms. With open windows, the internal conditions would exceed those required by BS 8233 for a bedroom. It is still acceptable that internal noise levels can be met with windows closed within the BS 8233 framework.

In addition to this, the condenser units are not appropriately vibration isolated in their existing configuration. This may give rise to structure-borne vibrations, which are not mitigated with the façade specification shown below. In order to mitigate this, the condenser units should be vibration isolated from the building's structure on anti-vibration mounts.

4.1 Acoustic Specification of Façade Elements – Bedrooms 1, 2

With this specification, the upstairs habitable bedrooms which are affected by noise from the condenser units (bedrooms 1 and 2) will meet the daytime ($L_{Aeq,16hour}$) and nighttime ($L_{Aeq,8hour}$) internal noise level guidelines of BS 8233: 2014, will meet NR20, and the WHO's nighttime maximum noise level (45 dB L_{AFmax}), providing windows are closed and background ventilation is supplied by trickle ventilators that provide enough acoustic attenuation.

Please note that this specification does not account for structure-borne vibration.

Element	Type	Octave Band Frequency						R_w/D_{nw}
		125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	
External Wall	R, dB	41	44	48	55	55	55	53 dB
Glazing (including frame)	R, dB	27	30	37	42	45	48	41 dB
Trickle ventilator – open (one per window)	Dne, dB	35	39	43	48	53	54	47 dB
Roof	R, dB	44	52	60	69	69	77	63 dB

Table 4.1: Acoustic Performance of Façade Elements

4.2 Construction Types to Meet Internal Noise Criteria of BS 8233: 2014 – Bedrooms 1, 2

An example of the type of constructions that could be used to meet the acoustic specification outlined in table 4.1 is provided below in table 4.2.

Any constructions and products can be specified and installed that meet the level of acoustic performance stated in table 4.1 to meet the criteria of BS 8233: 2014.

Element	Specification
External Wall	Typical masonry wall, plasterboard finish
Glazing (including frame)	Acoustic Double Glazing (e.g. Double - 10.8 (pvb) / 16 / 8.8 (pvb) with interlayer)
Roof	E.g. tiled roof, rafter cavity for mineral wool insulation, rafters with resilient rail, 2 x Gyproc Soundbloc or similar
Trickle ventilator	Acoustic Trickle Ventilator (E.g. Renson AK43)

Table 4.2: Typical construction types to meet acoustic specification

4.3 Acoustic Specification of Façade Elements – Living Room, Bedroom 3

With this specification, the habitable rooms will meet the daytime ($L_{Aeq,16hour}$) and nighttime ($L_{Aeq,8hour}$) internal noise level guidelines of BS 8233: 2014, and the WHO's nighttime maximum noise level (45 dB L_{AFmax}), providing windows are closed and background ventilation is supplied by trickle ventilators that provide enough acoustic attenuation.

The existing building is seen to meet this specification.

Element	Type	Octave Band Frequency						R_w/D_{nw}
		125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	
External Wall	R, dB	41	44	48	55	55	55	53 dB
Glazing (including frame)	R, dB	24	25	30	33	29	34	31 dB
Trickle ventilator – open (one per window)	D_{ne} , dB	29	22	32	30	29	29	30 dB
Roof	R, dB	22	37	43	49	57	57	45 dB

Table 4.3: Acoustic Performance of Façade Elements

4.4 Construction Types to Meet Internal Noise Criteria of BS 8233: 2014 – Living Room, Bedroom 3

An example of the type of constructions that could be used to meet the acoustic specification outlined in table 4.3 is provided below in table 4.4.

Any constructions and products can be specified and installed that meet the level of acoustic performance stated in table 4.3 to meet the criteria of BS 8233: 2014.

Element	Specification
External Wall	Typical masonry wall with plaster finish
Glazing (including frame)	Double glazing (e.g. 6/12/6)
Roof	Typical pitched roof, (e.g. tiles on felt, 12mm Plasterboard Ceiling, 100mm Mineral Wool insulation)
Trickle ventilator	Basic trickle ventilator

Table 4.4: Typical construction types to meet acoustic specification

4.5 Discussion of Assessment Outcome

This specification is based on the fact that there is a mechanical plant unit in close proximity to the proposed façade, which elevates ambient noise levels by at least 10 dB L_{Aeq} above the noise level when the unit does not operate.

If the unit did not operate at a noise level above the existing noise levels when not operational, then the daytime and nighttime noise levels would likely be significantly lower than measured during the survey. Therefore, it is likely that a more typical façade specification (standard double glazing, pitched roof, masonry wall) may provide adequate internal conditions.

As such, if there is possibility to reduce the noise levels from the unit at source, this may negate the need to provide higher performing acoustic façade elements for the roof and glazing portion of the upper floor of the proposal.

It may be worth the applicant exploring the possibility of attenuating the unit at source. A full assessment with input from the environmental health officer regarding the noise criteria for the unit would be required in this scenario.

Following an assessment of the mechanical plant noise and any subsequent mitigation at source, an additional noise survey and assessment would need to be undertaken to determine the new noise level at the proposal façade.

In any case, the acoustic specification provided in this section will meet NR20 and BS 8233 criteria based on the current noise levels inclusive of mechanical plant noise.

5.0 Conclusion

5.1 Summary of Assessment

Clear Acoustic Design has been appointed to conduct a noise assessment for a proposed residential development 8a Shelley Road, Worthing BN11 1TR.

The proposal is seen to be the development of a single residential dwelling in the existing building.

A noise impact assessment has been undertaken to ensure that internal noise levels of the habitable rooms meet the requirements of BS 8233: 2014, and NR20 in order to mitigate against noise emanating from condenser units operated by the adjoining shop on Shelley Road.

Noise from the sub-station was not seen to impact the proposal.

Based on the results of the noise survey, an acoustic specification of the façade elements has been provided to meet this requirement.

It should be noted that this specification does not account for structure-borne vibration, and that anti-vibration mounts should be fitted to the units to mitigate against these vibrations which may give rise to noise within the dwelling.

It should also be noted that, should the windows be opened in the dwelling, the required internal levels will not be achieved and that a mechanical ventilation strategy should be employed to avoid the need to open windows.

It should be noted that the upgraded acoustic specification is required in the upper bedrooms which are affected by the condenser units only. The downstairs living room, and upstairs bedroom 3 are not seen to be impacted by unsuitable levels of noise and a standard specification will adequately protect these rooms from environmental noise (i.e. standard double glazing (6/12/6), masonry wall, standard trickle ventilators, typical tiled/pitched roof).

5.2 Assessment Outcome

The assessment shows that providing the acoustic specification for the building detailed in table 5.1, and the recommendations outlined above are adhered to, the internal noise levels in the development will meet the internal noise level criteria as detailed in BS 8233: 2014 *Guidance on Sound Insulation and Noise Reduction for Buildings*.

Furthermore, the internal levels will meet NR20 and this is a positive indication that noise levels in the proposed dwelling will be suitable in the habitable rooms, even for the periods when the mechanical plant is operating at operational duty, as measured during our survey.

Supporting calculations for the façade specifications can be found in Appendix A below and are based on the worst-affected room types. The specification is based on the existing proposed layout.

Appendix A – Calculations

The noise level in a room due to sound penetrating a façade element may be calculated according to BS EN 12354-3 and BS 8233 from:

$$L_2 = L_{1,in} - R + 10 \times \text{Log}(S / V) + 10 \times \text{Log}(T) + 11$$

Where:

- L_2 = noise level in room due to sound through façade portion of area S and mean sound reduction index R , dB
- $L_{1,in}$ = external free-field noise level at the position of the façade, dB
- R = sound reduction index of portion, dB
- S = area of façade portion, m^2
- V = room volume, m^3
- T = reverberation time, s

For small façade components, such as ventilators, the noise level in a room may be calculated according to the same standards as above from:

$$L_2 = L_{1,in} - D_{n,e} - 10 \times \text{Log}(V) + 10 \times \text{Log}(T) + 21$$

Where:

- $D_{n,e}$ = element-normalised sound level difference of the ventilator.
(Other components have the same meaning as above).

The sound reduction of the masonry portion of the facade is much higher than that of the glazing and ventilation provision, therefore noise penetration through the masonry is typically disregarded as insignificant compared to noise penetration through the glazing and ventilation provision. The noise penetration through the vents and the glazing is calculated as above and then combined in each frequency band to give an overall internal level from the external sources by these routes.

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation						125	250	500	1000	2000	4000	dB(A)
Noise Level at Façade		58.5	62.0	56.3	51.5	48.2	42.7	58						
Additional Safety	0 dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Volume of room	51 m3													
Reverberation Time in room	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
A = Total absorption in Sabines 10*log(S/A)		16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4		
4.6		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6		
Facade Details														
Total Façade Area		47.0 m2												
Brick (215mm) plastered		20 m2												
External Wall														
Noise ingress through element		41	44	48	55	55	55							
Noise ingress through element		18.3	18.8	9.1	-2.6	-6.0	-11.4	12.3						
Double - 10.8(pvb)/16/8.8(pvb) with interlayer		2 m2												
Glazing														
Noise ingress through element		27	30	37	42	45	48							
Noise ingress through element		22.3	22.8	10.1	0.4	-6.0	-14.4	15.7						
		25 m2												
Insul Roof Design 2														
Noise ingress through element		44	52	60	69	69	77							
Noise ingress through element		16.3	11.8	-1.9	-15.7	-19.0	-32.4	5.4						
Trickle Vent - n=1 = one trickle vent		n = 1												
Renson AK43														
Trickle Vent		35	39	43	48	53	54							
Noise ingress through element		35	39	43	48	53	54							
Noise ingress through element		21.8	21.3	11.2	1.6	-7.3	-13.4	14.8						
Total Noise Level in Room		125	250	500	1000	2000	4000	dB(A)						
Target		NR 20												
Pass / Fail		26.4	26.2	15.2	6.1	2.3	0.6	19.6						
		39	31	24	20	17	14	30						
		Pass	Pass	Pass	Pass	Pass	Pass	Pass						

Figure 1: Bedroom (Daytime, 16 hour)

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation						125	250	500	1000	2000	4000	dB(A)
Noise Level at Façade		62.2	66.6	60.9	55.6	51.8	46.2	63						
Additional Safety	0 dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Volume of room	51 m3													
Reverberation Time in room	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
A = Total absorption in Sabines 10*log(S/A)		16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4		
10*log(S/A)		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6		
Facade Details														
Total Façade Area		47.0 m2												
Brick (215mm) plastered		20 m2												
External Wall														
Noise ingress through element		41	44	48	55	55	55							
Noise ingress through element		22.0	23.5	13.8	1.4	-2.3	-7.9	16.8						
Double - 10.8(pvb)/16/8.8(pvb) with interlayer		2 m2												
Glazing														
Noise ingress through element		27	30	37	42	45	48							
Noise ingress through element		26.0	27.5	14.8	4.4	-2.3	-10.9	20.2						
		25 m2												
Insul Roof Design 2														
Noise ingress through element		44	52	60	69	69	77							
Noise ingress through element		20.0	16.4	2.7	-11.6	-15.4	-29.0	9.8						
Trickle Vent - n=1 = one trickle vent		n = 1												
Renson AK43														
Trickle Vent		35	39	43	48	53	54							
Noise ingress through element		35	39	43	48	53	54							
Noise ingress through element		25.5	26.0	15.8	5.7	-3.7	-9.9	19.3						
Total Noise Level in Room		125	250	500	1000	2000	4000	dB(A)						
Target		39	31	24	20	17	14	30						
Pass / Fail		Pass	Pass	Pass	Pass	Pass	Pass	Pass						

Figure 2: Bedroom (Nighttime, 8 hour)

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation						125	250	500	1000	2000	4000	dB(A)	
Noise Level at Façade		62.2	66.6	60.9	55.6	51.8	46.2	63							
Additional Safety	0 dB	0.0	0.0	0.0	0.0	0.0	0.0								
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0								
Volume of room	51 m3														
Reverberation Time in room	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5								
A = Total absorption in Sabines		16.4	16.4	16.4	16.4	16.4	16.4								
10*log(S/A)		4.6	4.6	4.6	4.6	4.6	4.6								
Facade Details															
Total Façade Area		47.0 m2													
Brick (215mm) plastered		20 m2		41	44	48	55	55	55						
External Wall															
Noise ingress through element		22.0	23.5	13.8	1.4	-2.3	-7.9	16.8							
Double - 10.8(pvb)/16/8.8(pvb) with interlayer		2 m2		27	30	37	42	45	48						
Glazing															
Noise ingress through element		26.0	27.5	14.8	4.4	-2.3	-10.9	20.2							
		25 m2		44	52	60	69	69	77						
Insul Roof Design 2															
Noise ingress through element		20.0	16.4	2.7	-11.6	-15.4	-29.0	9.8							
Trickle Vent - n=1 = one trickle vent		n = 1		35	39	43	48	53	54						
Renson AK43				35	39	43	48	53	54						
Trickle Vent															
Noise ingress through element		25.5	26.0	15.8	5.7	-3.7	-9.9	19.3							
Open Window (based upon Napier published data)															
Window type	Opening outwards														
Opening area	0.1 m2														
Opening distance	10.8 cm														
Source angle (horizontal)	-35°														
Dne		24.1	18.4	19.8	21.4	23	24.2								
Number of windows (n = 0 ignores windows)		n = 1													
Total opening area		0.1 m2													
Dne-10Log(n)		24.1	18.4	19.8	21.4	23	24.2								
Predicted noise level through open window		Lff-Dne+10log(A0/A)+K		35.9	46.1	38.9	32.0	26.6	19.9	40.7					
Total Noise Level in Room		36.9	46.2	39.0	32.1	26.7	19.9	40.8							
Target	NR 20	39	31	24	20	17	14	30							
	Pass / Fail	Pass	Fail	Fail	Fail	Fail	Fail	Fail							

Figure 3: Bedroom – Window Open (Nighttime, 8 hour)

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation						125	250	500	1000	2000	4000	dB(A)
Noise Level at Façade		65.6	70.3	64.4	58.5	55.1	49.8							66
Additional Safety	0 dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Volume of room	51 m3													
Reverberation Time in room	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
A = Total absorption in Sabines 10*log(S/A)		16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4		
4.6		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6		
Facade Details														
Total Façade Area		47.0 m2												
Brick (215mm) plastered		20 m2												
External Wall														
Noise ingress through element		41	44	48	55	55	55							
Noise ingress through element		25.5	27.2	17.2	4.3	1.0	-4.3							20.4
Double - 10.8(pvb)/16/8.8(pvb) with interlayer		2 m2												
Glazing														
Noise ingress through element		27	30	37	42	45	48							
Noise ingress through element		29.5	31.2	18.2	7.3	1.0	-7.3							23.8
		25 m2												
Insul Roof Design 2														
Noise ingress through element		44	52	60	69	69	77							
Noise ingress through element		23.4	20.1	6.2	-8.7	-12.0	-25.3							13.4
Trickle Vent - n=1 = one trickle vent		n = 1												
Renson AK43														
Trickle Vent		35	39	43	48	53	54							
Noise ingress through element		35	39	43	48	53	54							
Noise ingress through element		28.9	29.7	19.3	8.6	-0.3	-6.3							22.9
Total Noise Level in Room		125	250	500	1000	2000	4000							dB(A)
Total Noise Level in Room		33.5	34.6	23.2	12.2	6.5	2.5							27.6
Target		39	31	24	20	17	14							45

Figure 4: Bedroom (Maximum)

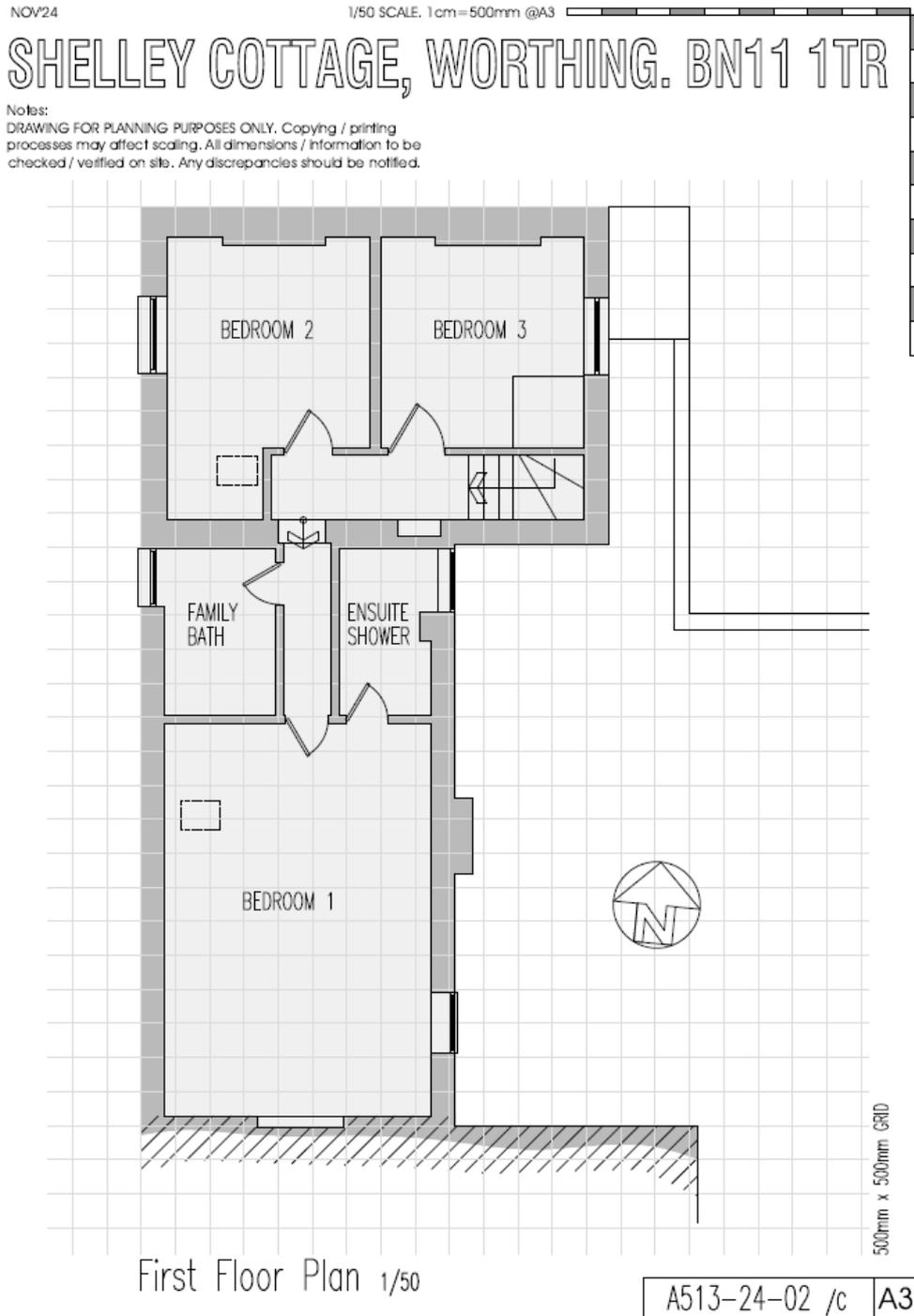
CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation						125	250	500	1000	2000	4000	dB(A)
Noise Level at Façade		58.5	62.0	56.3	51.5	48.2	42.7	58						
Additional Safety	0 dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Volume of room	100 m3													
Reverberation Time in room	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
A = Total absorption is Sabines 10*log(S/A)		32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2		
10*log(S/A)		1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6		
Facade Details														
Total Façade Area		47.0 m2												
Brick (215mm) plastered		40 m2												
External Wall														
Noise ingress through element		18.4	18.9	9.2	-2.6	-5.9	-11.3	12.4						
Double - 6/12/6		7 m2												
Glazing														
Noise ingress through element		27.9	30.3	19.6	11.9	12.5	2.1	24.0						
Flat timber-joist roof, asphalt on boarding, 12mm p/bd ceiling,		0 m2												
Roof														
Noise ingress through element		-99.0	-99.0	-99.0	-99.0	-99.0	-99.0	-92.7						
Trickle Vent - n=1 = one trickle vent		n = 1												
Basic Trickle Vent														
Trickle Vent														
Noise ingress through element		24.4	35.2	19.3	16.6	13.8	8.4	27.7						
Total Noise Level in Room		29.8	36.5	22.7	18.0	16.4	9.8	29.4						
Target	NR 20	39	31	24	20	17	14	35						

Figure 5: Living Room (Daytime, 16 hour)

CLEAR ACOUSTIC DESIGN		BS8233 Noise Break-in Calculation						125	250	500	1000	2000	4000	dB(A)
Noise Level at Façade		49.1	46.6	45.7	43.8	39.5	33.0							48
Additional Safety	3 dB	3.0	3.0	3.0	3.0	3.0	3.0							
Facade Corrections	Lff	0.0	0.0	0.0	0.0	0.0	0.0							
Volume of room	25 m3													
Reverberation Time in room	0.5 s	0.5	0.5	0.5	0.5	0.5	0.5							
A = Total absorption is Sabines		8.0	8.0	8.0	8.0	8.0	8.0							
10*log(S/A)		3.6	3.6	3.6	3.6	3.6	3.6							
Facade Details														
Total Façade Area		18.3 m2												
Brick (215mm) plastered		6 m2												
External Wall		41	44	48	55	55	55							
Noise ingress through element		9.9	4.4	-0.6	-9.4	-13.7	-20.2							0.9
Double - 6/12/6		1 m2												
Glazing		24	25	30	33	29	34							
Noise ingress through element		19.1	15.6	9.7	4.8	4.5	-7.0							12.7
Tiled/slated roof, 25mm p/bd ceiling, 100mm m/w		11 m2												
Roof		27	37	43	48	52	52							
Noise ingress through element		26.6	14.1	7.2	0.3	-8.0	-14.5							12.7
Trickle Vent - n=1 = one trickle vent		n = 1												
Basic Trickle Vent		29	22	32	30	29	29							
Trickle Vent		29	22	32	30	29	29							
Noise ingress through element		24.1	28.9	17.8	18.0	14.2	7.7							23.9
Total Noise Level in Room		29.1	29.3	18.8	18.4	14.8	8.5							24.6
Target		39	31	24	20	17	14							30
Pass / Fail		Pass	Pass	Pass	Pass	Pass	Pass							Pass

Figure 6: Bedroom 3 (Nighttime, 8 hour)

Appendix B – Proposal Plans

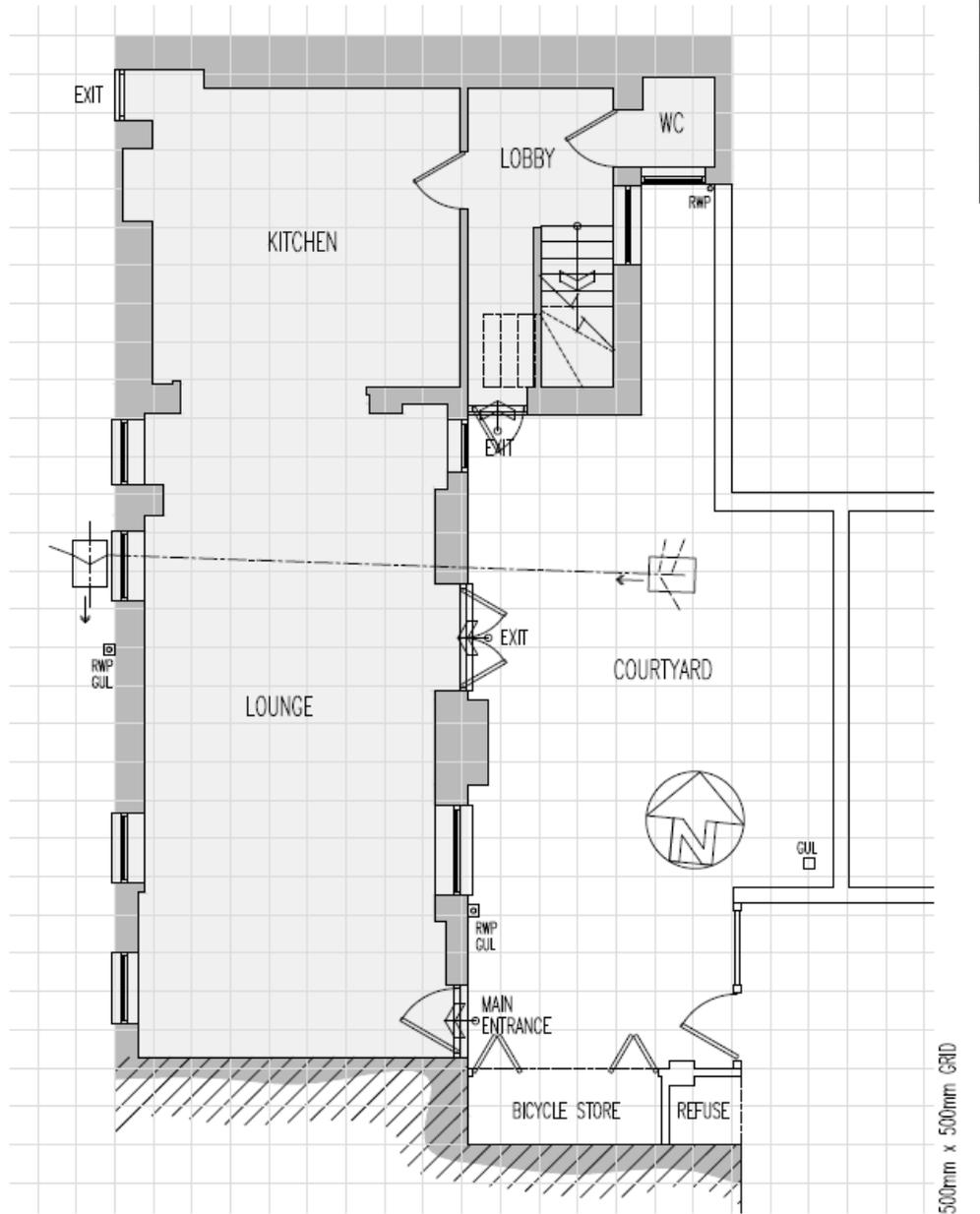


NOV/24

1/50 SCALE. 1cm=500mm @A3

SHELLEY COTTAGE, WORTHING. BN11 1TR

Notes:
DRAWING FOR PLANNING PURPOSES ONLY. Copying / printing
processes may affect scaling. All dimensions / information to be
checked / verified on site. Any discrepancies should be notified.



Ground Floor Plan 1/50

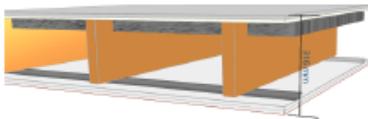
A513-24-01 /E A3

Sound Insulation Prediction (v10.0.4)

Program copyright Marshall Day Acoustics 2023 | Margin of error is generally within $R_w \pm 3$ dB

Date: 30/01/2025

Job Name:

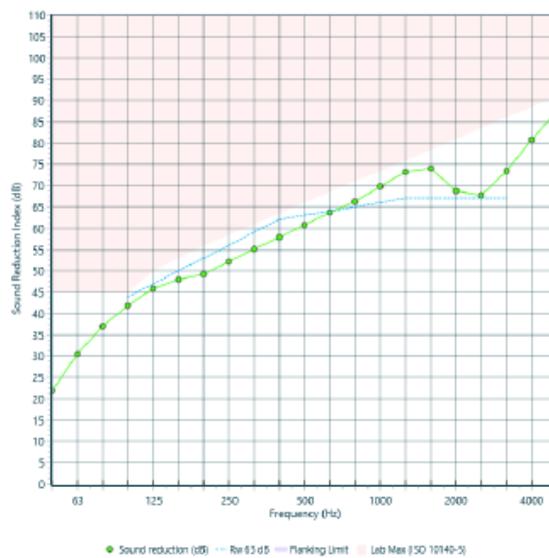


R_w 63 dB
 C -1 dB
 Ctr -6 dB

System description

- Panel 1 1 x 14 mm Roofing tiles + 1 x 9 mm WeatherPro-L
- Frame Solid Joist with resilient rail (250 mm x 45 mm) . Stud spacing 600 mm , Cavity Width 268 mm + 50 mm Rockwool (33kg/m3)
- Panel 2 1 x 12.5 mm Gyproc SoundBloc 12.5mm + 1 x 12.5 mm Gyproc SoundBloc 12.5mm
- Details Panel Size 2.7 m x 4.0 m, Partition surface mass = 68.6 kg/m², Mass-air-mass resonant frequency = : 29 Hz

freq.(Hz)	R(dB)	Roct (dB)
50	22	
63	31	26
80	37	
100	42	
125	46	44
160	48	
200	49	
250	52	52
315	55	
400	58	
500	61	60
630	64	
800	66	
1000	70	69
1250	73	
1600	74	
2000	69	69
2500	68	
3150	73	
4000	81	77
5000	87	



- Key No. 6504 | Initials:Nathan Matthews | File Name:Insul - roof design 2.rvt

Appendix C – Glossary

dB(A)

A frequency filtering system which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed as dB(A), has been shown to correlate with a human's subjective response to noise.

Decibel (dB)

A relative unit for the measurement of sound. The dB is a logarithmic ratio between the measured level and a reference (threshold) level of 0dB.

D level difference

The difference in sound levels in two spaces separated by a partition, measured as part of a sound insulation test according to BS EN ISO 140.

D_{ne}

Standardised level difference values for small elements (e.g. ventilators).

Hertz (Hz)

The frequency (or pitch) of a sound. 1 Hz = 1 cycle per second, 1 kHz = 1000 Hz, 2 kHz = 2000 Hz, etc.

L_{Aeq, T}

The equivalent continuous sound level is a notional steady state level which over a quoted time period would have the same acoustic energy content as the actual fluctuating noise measured over that period. L_{Aeq,16hour} (07:00 to 23:00 hours) and L_{Aeq,8hour} (23:00 to 07:00 hours) are used to qualify daytime and night-time noise levels respectively.

L_{AFmax}

The highest, A-weighted instantaneous sound level recorded during the measurement period. The subscript 'F' denotes fast time weighting.

$L_{Ar,Tr}$

The 'rating level', as described in BS 4142: 2014 + A1: 2019 is the specific noise source plus any adjustment for the characteristic features of the sound.

L_{A90}

The A-weighted sound level which is exceeded for 90% of the measurement period. i.e. The level exceeded for 54 minutes of a 1 hour measurement – used as a measure of the background noise level.

R_w

Weighted Sound Reduction Index (R_w) is a single number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies, based on laboratory measurements.

Sound Pressure Level (L_p)

A logarithmic measure of the effective pressure of a sound relative to a reference value, defined in dB (decibel). Sound pressure is the local deviation from the ambient air pressure caused by a sound wave. As the pressures to which the human ear responds can range from 20 μ Pa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = RMS sound pressure in Pa; and p_0 = reference sound pressure (20 μ Pa).