

Consultants in Noise & Vibration
Building Regulations Certification Sound Insulation Testing

REPORT TITLE: NOISE ASSESSMENT FOR A PROPOSED RESIDENTIAL DEVELOPMENT AT
GREENBANKS, LONDON ROAD, ST IPPOLYTS, HITCHIN SG4 7NJ



REPORT REF: 26030-002

ISSUED TO: Bonnel Construction Ltd

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SUMMARY

- This report provides a noise assessment for a proposed residential development at Greenbanks, London Road, St Ippolyts, Hitchin SG4 7NJ. The proposal is for 4 x new-build two storey dwellings. An existing dwelling and outbuildings at the site are to be demolished.
- The noise assessment is to support a planning application for the proposed development and is requested by the Local Planning Authority (North Hertfordshire District Council).
- As part of the assessment process a noise survey has been conducted at the development site. The survey position was as “worse-case” representative of at the west elevation façades of the proposed new dwellings as nearest to, and facing towards, the adjacent B656 London Road.
- The prevailing noise climate at the development site is predominantly due to passing traffic in either direction on London Road. During lulls in traffic the otherwise noise climate is very low. There is also occasional noise from aircraft. However, although noise from aircraft is noticeable, the contribution of aircraft noise does not significantly contribute to overall day and night period noise levels at the development site as compared with the noise of road traffic.
- The noise assessment is with reference to North Hertfordshire District Council planning policy (noise), relevant British Standards including BS8233:2014 “*Guidance on Sound Insulation and Noise Reduction for Buildings*”, plus other guidance documents including ProPG: *Planning & Noise New Residential Development* and The Acoustic Ventilation & Overheating Residential Design Guide (AVO document).
- The assessment indicates the site is suitable for residential development from a noise perspective, subject to appropriate / commensurate noise mitigation measures to protect future occupiers against noise.
- A scheme of noise mitigation measures for the proposed development dwellings is established and included in Section 7 of the report. The mitigation measures are to ensure compliance with the noise levels guidance for residential dwellings of BS8233:2014.
- The development's scheme of noise mitigation measures is verified using the rigorous calculations procedure outlined in Section G.2, Annex G (informative) of BS8233:2014 and includes acoustic performance specifications for glazing and ventilation provision to the proposed dwellings.

1. INTRODUCTION

A residential development is proposed at Greenbanks, London Road, St Ippolyts, Hitchin SG4 7NJ.

The development proposal is for 4 x new-build two storey dwellings, identified Houses 1 to 4. The houses are detached type. An existing dwelling and outbuildings at the site are to be demolished.

As part of pre-application advice, the Local Planning Authority (North Hertfordshire District Council) has requested a noise assessment as part of the proposed development's planning application submission. This is for reason to ensure appropriate noise mitigation measures with reference the amenity of future occupiers.

The Council's pre-application advice identifies the main source of noise to the application site is from traffic on the adjacent B656 London Road.

This report provides a noise assessment for the development and includes:

- Qualifications & experience;
- Description of the proposed development;
- Noise assessment methodology, standards & criteria for residential development, with reference to North Hertfordshire District Council planning policy (noise), relevant British Standards and other guidance documents;
- Measurement survey of noise levels at the development site, including procedure, instrumentation, results and subjective observations;
- Noise assessment;
- Scheme of noise mitigation measures.

2. QUALIFICATIONS & EXPERIENCE

This report is prepared and issued by David Philip. David Philip graduated in 1989 from The University of Salford Department of Applied Acoustics with a BEng Honours degree in Electroacoustics. David Philip has been since 1995, and continues to be, a fully elected Member of the Institute of Acoustics (MIOA).

David Philip has been the owner / managing director of Philip Acoustics since the firm was formed in 2002. Prior to the formation of Philip Acoustics, David Philip held senior acoustic consultant positions at Sound Research Laboratories (London office) and Spectrum Acoustic Consultants.

Philip Acoustics has held full membership of the Association of Noise Consultants (ANC) since 2003 and is also a full member of the ANC Registration Scheme of approved independent organisations to undertake Building Regulations Approved Document Part E pre-completion certification sound insulation testing.

David Philip has over 35 years' experience as an Acoustic Consultant both in the UK and internationally and has considerable experience undertaking noise surveys and noise assessments for a wide range of planning application and development scenarios.

This experience includes a substantial quantity of noise assessments including with schemes for noise mitigation measures specifically associated with change of use (conversion), extension/addition and new-build residential developments. This experience also includes many noise assessments for proposed residential developments under jurisdiction of North Hertfordshire District Council.

David Philip is fully familiar with the provisions of current national planning noise policy guidance, British Standards, and other guidance documents relevant for noise assessments and noise criteria associated with residential developments.

The opinions expressed in this report are the true and professional opinions of David Philip. Neither David Philip nor Philip Acoustics is appointed on any incentive fee basis.

3. DEVELOPMENT DESCRIPTION

The application site is in a rural setting, adjacent east of the B656 London Road, approximately 1.5km south from the outskirts of Hitchin.

There is an existing residential dwelling, multiple outbuildings and open land at the site. The existing dwelling and outbuildings are to be demolished.

The immediate surrounding area includes neighbouring residential properties either side (Hobbs Hall, Peascod Hall plus Peascod Cottage) and farmland / fields.

An aerial image indicating location of the development site is provided in Appendix A.

The proposed development is for 4 x new-build two storey dwellings, identified Houses 1 to 4. The houses are detached type and to be formed as conventionally with brick & blockwork insulated cavity walls plus insulated pitched tile roofs.

The dwellings each have private rear garden areas and a shared entrance driveway off the B656 London Road to the front. The dwellings are all set back broadly equidistant from London Road, albeit Houses 1 & 4 are slightly closer to London Road than Houses 2 & 3.

Copy of the proposed development's site plan and floor plan layout drawings are also provided in Appendix A.

4. RESIDENTIAL DEVELOPMENT NOISE ASSESSMENT METHODOLOGY & CRITERIA

This section provides details for relevant noise assessment guidance, standards, methodology and criteria as applicable for the proposed residential development.

4.1 North Hertfordshire District Council Planning Policy (*Noise*)

North Hertfordshire District Council Local Development Framework - *Design Supplementary Planning Document (SPD)* July 2011 *Appendix A: Relevant Guidance* includes reference to Government Planning Policy Guidance Note 24: Planning and Noise (PPG24) 1994. However, PPG24 is now withdrawn from use, see Sub-Section 4.2 of the report.

North Hertfordshire District Council Local Plan 2011-2031 also includes reference to noise associated with development proposals.

The Council's Local Plan has several policies related to protection of living conditions and amenity. Example relevant Policy D3: *Protecting Living Conditions* from Section 9: *Design* of Local Plan 2011-2031 is reproduced below:

Policy D3: Protecting living conditions
Planning permission will be granted for development proposals which do not cause unacceptable harm to living conditions
Where the living conditions of proposed developments would be affected by an existing use or the living conditions of an existing development would be affected by a proposed use, the Council will consider whether there are mitigation measures that can be taken to mitigate the harm to an acceptable level. If the Council is not satisfied that mitigation proposals would address the identified harm, development proposals will not be permitted.

Neither Policy D3, its associated supporting paragraphs nor other planning guidance or policies of the Council provide specific guidance on noise standards (criteria) and/or assessment methodology, including as would be applicable for the proposed development.

Notwithstanding the above, Philip Acoustics has conducted noise assessments for multiple other proposed residential developments under the jurisdiction of North Hertfordshire District Council, including where permission for development was granted subject to various conditions, including with respect to noise.

The Council's noise requirements / criteria commonly included as part of planning consent conditions for residential development is based on the guidance and standards for internal ambient noise levels to within residential dwellings of relevant British Standard BS8233:2014, see Sub-Section 4.3 of the report.

4.2 Government National Planning Policy Guidance

4.2.1 Planning Policy / Practice Guidance

Government national planning policy guidance relating to noise was until 2012 principally provided by Planning Policy Guidance Note 24: Planning and Noise (PPG24) 1994. PPG24 was withdrawn upon the Government's publication of the National Planning Policy Framework (NPPF) – see Sub-Section 4.2.2.

Government's Planning Practice Guidance for noise (PPG-N), current edition July 2019 update, is an online resource providing general guidance for noise in respect to planning.

PPG-N does not provide any prescriptive noise assessment methodology or noise limits criteria and instead provides more of an overview for aims and objectives, all as aligned with the Government's Policy documents NPPF and NPSE as detailed in Sub-Section 4.2.2.

However, PPG-N does refer to other guidance and documents which do provide noise assessment methodology and/or criteria, including British Standard BS8233:2014 and ProPG: *Planning & Noise New Residential Development*, as detailed in Sub-Sections 4.3 & 4.5 respectively.

4.2.2 National Planning Policy Framework (NPPF) & Noise Policy Statement For England (NPSE)

The National Planning Policy Framework (NPPF) was first published March 2012. The current edition of NPPF is dated December 2024.

In addition, and to provide context for NPPF regarding noise, the Noise Policy Statement for England (NPSE) was published March 2010.

NPPF and NPSE are both “high level” documents that, in terms of noise, define noise management aims, objectives and outcomes in terms of achieving sustainable development.

The NPPF and NPSE documents do not prescribe any noise assessment methodology or criteria, such as numerically defining or categorising the acceptability of noise levels affecting a residential development site, including from such as road traffic etc.

4.3 British Standard BS8233

This standard is referenced by the Government's Planning Practice Guidance for noise (PPG-N) and also by most Local Planning Authorities as noise assessment methodology and criteria for new residential development.

Full title of the current edition of the standard is BS8233:2014 “*Guidance on Sound Insulation and Noise Reduction for Buildings*”.

To ensure protection for residential occupiers against noise, BS8233:2014 provides relevant guidance for indoor ambient noise levels within dwellings plus also noise levels within external amenity spaces.

Indoor Ambient Noise Levels Within Dwellings

The guidance for indoor ambient noise levels within dwellings of BS8233:2014 is contained within Table 4 in Section 7.7.2 *Internal ambient noise levels for dwellings* of the standard as reproduced below:

BS8233:2014 defines it is desirable that internal ambient noise levels due to external noise ingress do not exceed these values.

Activity	Location	BS8233:2014 Guidance For Desirable Internal Ambient Noise Levels	
		07:00 to 23:00 (day period)	23:00 to 07:00 (night period)
Resting	Living room	$\leq 35\text{dB } L_{Aeq,16\text{hour}}$	
Dining	Dining room/area	$\leq 40\text{dB } L_{Aeq,16\text{hour}}$	
Sleeping (daytime resting)	Bedroom	$\leq 35\text{dB } L_{Aeq,16\text{hour}}$	$\leq 30\text{dB } L_{Aeq,8\text{hour}}$

The above are appropriate / relevant applied as noise criteria for the proposed development residential dwellings.

In addition to the noise standards / criteria detailed above, Note 4 to Table 4 in Section 7.7.2 *Internal ambient noise levels for dwellings* of BS8233:2014 advises that regular individual noise events (e.g. night period scheduled aircraft or passing trains) can cause sleep disturbance and that a guideline noise limit value may be set for bedrooms (at night) in terms of SEL or $L_{A\text{Fmax}}$ depending on the character and number of events per night.

Although the dominant prevailing noise climate at the site including during the night period (11pm to 7am) is of traffic on London Road, there is also occasional noise from aircraft. Therefore in accordance with the guidance of BS8233:2014, and as good practice, it is considered appropriate to apply a $L_{A\text{Fmax}}$ criterion for bedrooms during the night period.

BS8233:2014 does not provide any specific guidance on night period $L_{A\text{Fmax}}$ values for noise into bedrooms, the $L_{A\text{Fmax}}$ limit guidance for bedrooms contained within the previous edition BS8233:1999 is removed from the current edition BS8233:2014.

Notwithstanding this, the noise assessment in this report uses a criterion $L_{A\text{Fmax}}$ 45dB for bedrooms during the night period, as per guidance of BS8233:1999 and as per the guidance of other current relevant documents including ProPG: *Planning & Noise New Residential Development* (see Sub-Section 4.5).

In accordance with normal acoustic design practice plus ProPG document guidance, the criterion is applied on the basis that individual noise events should not regularly exceed $L_{A\text{Fmax}}$ 45dB in bedrooms at night, defined as occurring generally more than 10 times a night or several times in any one hour during the night.

It is not intended the $L_{A\text{Fmax}}$ criterion be applicable to infrequent night period very high noise level events such as sirens of emergency vehicles, sounding of vehicle horns or fireworks celebrations etc.

In applying the BS8233:2014 guidance detailed on the previous page as indoor ambient noise level standards / criteria, then in accordance with normal acoustic design practice and definition, it is taken that:

- The internal noise level criteria are to be achieved due to all-encompassing prevailing external noise at the development site;
- The internal noise level criteria are to be achieved inside unoccupied but completed and normally furnished rooms of the dwellings;
- The day period noise level criterion for living rooms is applicable for kitchen and/or dining areas as open plan to living areas (i.e. combined living/kitchen/dining areas as a whole).

Noise Levels Within External Amenity Space

BS8233:2014 also provides guidance regarding noise to external amenity spaces associated with residential dwellings such as private rear garden areas, balconies and terraces etc.

The guidance of BS8233:2014 for noise within external amenity space of dwellings such as private gardens is reproduced below, generally taken as applicable for the 16-hour day period (07:00-23:00):

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments".

However, BS8233:2014 recognises the guidance on noise levels within external amenity spaces as outlined above (including the upper value $L_{Aeq,T}$ 55dB) is not achievable in all circumstances, and that in such situations is development should not be prohibited.

4.4 British Standard BS4142

In the scenario of a proposed residential development site (and/or existing residential properties) affected by a specific, dominant and/or otherwise significant commercial and/or industrial type noise including noise from mechanical services plant such as extract ventilation, air conditioning or refrigeration equipment, then it is generally appropriate to consider assessment of the noise using British Standard BS4142.

Full title of the current edition of the standard is BS4142:2014+A1:2019 "Methods for rating and assessing industrial and commercial sound".

The development site is not affected by noise contributions associated with industrial or commercial premises. It is not necessary to undertake any separate assessment for the proposed development under the provisions of BS4142:2014.

4.5 ProPG: *Planning & Noise New Residential Development*

Although not constituting an official government document or code of practice, Professional Practice Guidance document ProPG: *Planning & Noise New Residential Development* dated May 2017 provides noise assessment guidance applicable for new residential development.

The ProPG document is issued by a working group of practitioners (including acoustic consultants and Local Authority Environmental Health Officers) allied with noise assessments for proposed new residential developments.

The ProPG document encourages early-stage consideration of noise within the planning process and good acoustic design, including with significant reference to guidance of the current editions of British Standards BS8233 and BS4142.

In overview terms as applicable for the proposed development, advice of the ProPG document correlates with the guidance of BS8233:2014, including in respect to internal noise levels within dwellings and also noise levels to external amenity spaces.

In addition, a key aspect of guidance within the ProPG document as supplementary to BS8233:2014 is that it provides methodology for an initial Site Noise Risk Assessment, intended for use before a proposed residential development's planning submission. Section 6 of this report uses the noise survey results to include a Site Noise Risk Assessment for the proposed development as per guidance of the ProPG document.

4.6 Acoustic Ventilation & Overheating Residential Design Guide

As similar to the ProPG document, and again although not constituting an official government document or guidance / advice, the Acoustic Ventilation & Overheating Residential Design Guide January 2020 (AVO document) issued jointly by the Association of Noise Consultants (ANC) & Institute of Acoustics (IOA) provides relevant noise guidance allied with noise assessments for new residential developments.

The AVO document is lengthy and technically complex, with significant background reference to relevant legislation and guidance including BS8233:2014 and Building Regulations Approved Documents.

In simple overview terms; the AVO document guidance seeks to address issues associated with the competing demands of closed windows to mitigate external noise ingress into residential dwellings and of open windows to provide reasonable ventilation / thermal conditions.

Reference to guidance of the AVO document and Building Regulations Approved Documents as relevant to noise aspects associated with ventilation and overheating is included in Sub-Section 7.3 *Ventilation Provision* of the report.

5. NOISE LEVELS SURVEY

A noise levels measurement survey has been conducted as part of the assessment process to establish the character / magnitude of noise climate at the development site and inform a scheme for noise mitigation measures for the proposed dwellings. Details of the survey are provided in the following sub-sections.

5.1 Survey Instrumentation

Details of the noise survey instrumentation used are provided in Appendix B. The sound level meters were calibration verified before and after the survey measurements.

5.2 Survey Details & Procedure

The noise measurement survey was partly attended (observed) by the author, conducted using a logging type sound level meter over a three day sample period Wednesday 17 June 2026 through Friday 19 June 2026.

Weather conditions were monitored and were suitable for the noise survey i.e. not adversely contaminating / influencing the measurements. Weather conditions were dry (nil precipitation) and with light wind.

A single primary measurement position on the site was selected for the noise survey, as “worse-case” representative of at the west elevation façades of Houses 1 & 4 as nearest to, and facing towards, the adjacent B656 London Road. The measurement position was at equivalent first floor level windows height, as free-field levels recorded principally in terms of $L_{Aeq,T}$ and L_{Amax} values ($T = 5 \text{ minutes}$) for the full survey duration. Other parameter noise measurements and statistical values were recorded for information.

Informative 1: Noise Survey Position

Noise levels for the assessment of residential development sites are generally measured at 1.2 to 1.5m above ground level in free-field conditions. However for this site it was necessary to measure noise levels at equivalent first floor level windows elevated height.

This is for reason noise levels at 1.2 to 1.5m above ground level would be non-representative for the proposed development due to acoustic screening (reduction) of noise from traffic by an existing close boarded fence structure along length of the site's boundary to London Road. This existing fence is to be removed and replaced by five bar estate railings for the proposed development.

In addition to the primary position survey, short term day period noise samples were also concurrently recorded during the survey at a secondary measurement position externally to rear of existing buildings at the site 1.5m above ground level in equivalent free-field conditions. These measurements were conducted to establish the magnitude of noise to rear garden areas of the proposed dwellings relative to noise levels at the front elevation primary measurement position.

The primary and secondary noise survey positions are indicated on the aerial image and proposed development site plan in Appendix A.

Samples of octave band values were also obtained to provide frequency content information of noise levels to assist with BS8233:2014 Annex G rigorous procedure calculations to establish and verify the development's scheme of noise mitigation measures.

5.3 Survey Results & Observations

Complete raw data results of the three day primary position noise survey in terms of L_{Aeq} and $L_{A_{fmax}}$ values are provided in Appendix C.

As expected, the prevailing noise climate at the development site is predominantly due to passing traffic in either direction on the adjacent B656 London Road. During lulls in traffic the otherwise noise climate is very low.

There is occasional noise from aircraft, expected to be mostly as associated with London Luton airport. However, although noise from aircraft is noticeable, the contribution of aircraft noise does not significantly contribute to overall day and night period noise levels at the development site as compared with the noise of road traffic.

The overall dominance of noise from road traffic is indicative in that noise levels follow a nominally diurnal profile characteristic. Noise levels are fluctuating throughout much of the day, then with levels gradually reducing during the evening and into the night as traffic reduces (lowest during the night period between around 1am to 4am) before rising again in the morning as traffic increases.

Analysis of the survey results in terms of overall $L_{Aeq,T}$ values for the separate day and night periods of the completed whole day of the survey plus night period $L_{A_{fmax}}$ values are shown in Table 1.

Description		Noise Levels At Development Site	
		Overall Period $L_{Aeq,T}$	Night Period $L_{A_{fmax}}^{(1)}$
24 hour period: 18 June 2026	Day period 07:00-23:00	55dB _(16hour)	
	Night period 23:00-07:00	50dB _(8hour)	72dB
Note⁽¹⁾: Night period $L_{A_{fmax}}$ value is the typical / regular occurring high $L_{A_{fmax}}$ level occurring more than 10 times during the night period or several times in any one hour during the night period. During majority of the night period, average / typical $L_{A_{fmax}}$ values are in the region circa at least 10 to 15dB lower than the value reported.			

Table 1: Development site free-field external noise levels (proposed dwellings' nearest elevations to London Road)

Secondary position sample measurements externally to rear of existing buildings at the site indicated noise levels pro-rata circa 5 to 8dB lower than those at the London Road front elevation primary measurement position.

This is principally because rear of the site is partially screened by existing buildings from traffic on London Road, plus also, albeit to a lesser extent, the rear is slightly more distant from London Road.

Same will occur for the proposed development, i.e. noise levels to rear of the new dwellings and within private rear garden areas will be lower than levels to the dwellings' front elevations overlooking London Road.

6. NOISE ASSESSMENT

In terms of a general subjective observations noise assessment based on experience of the author, overall noise levels at the development site are moderate and as normal / typical for this location adjacent to London Road.

In overall planning context, day and night period noise levels externally to the site are in relative terms lower than those to the majority of approved residential development sites in more urban areas adjacent to roads.

Technical noise assessment of the proposed development using results of the noise survey (overall day and night period values), and following the guidance of Stage 1: Initial Site Noise Risk Assessment of document ProPG: *Planning & Noise New Residential Development* indicates the following:

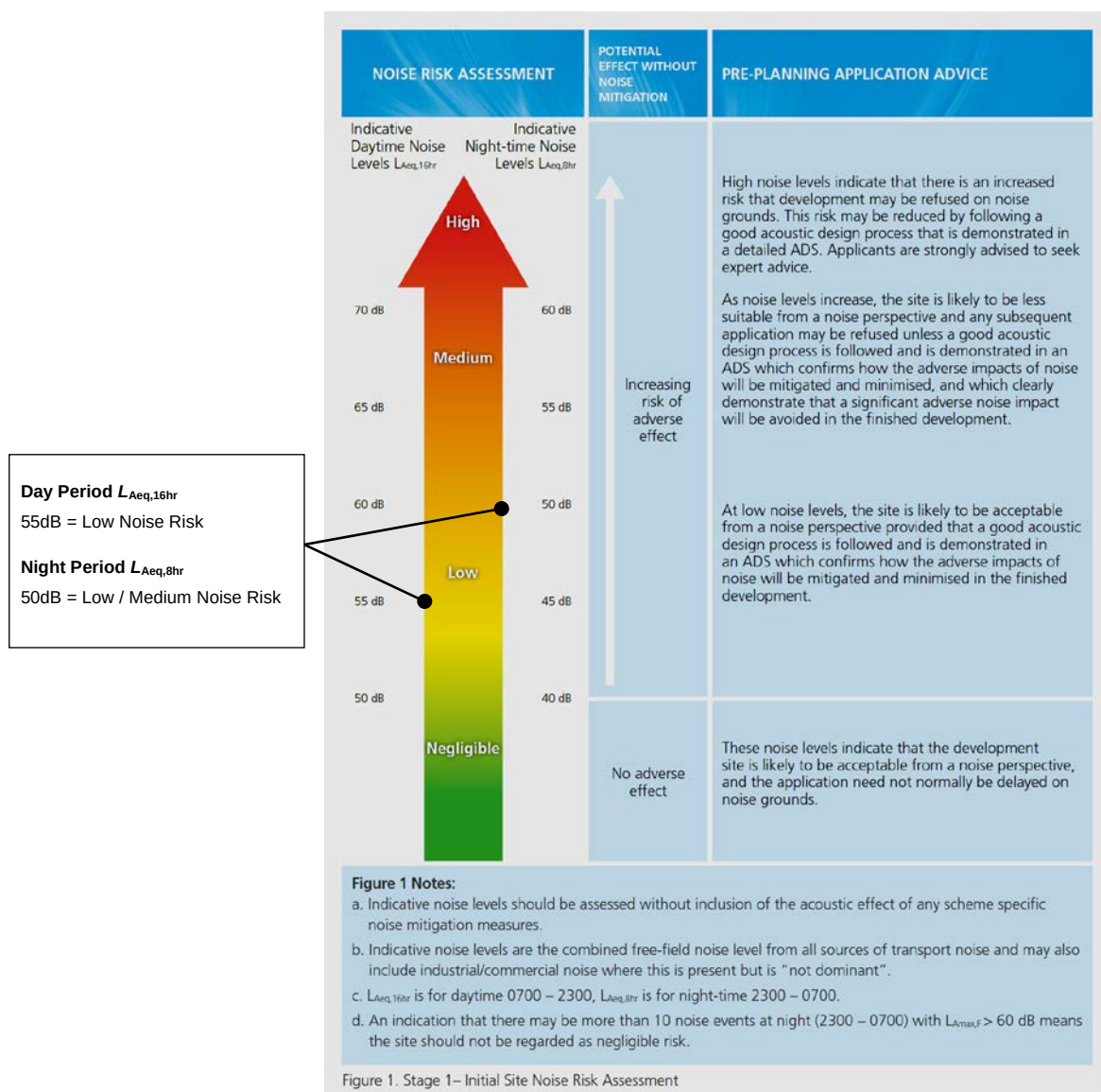
- **Day Period $L_{Aeq,16hour}$ 55dB = Low Noise Risk;**
- **Night Period $L_{Aeq,8hour}$ 50dB = Low / Medium Noise Risk.**

The Noise Risk Assessment guidance of the ProPG document is on a visually represented sliding scale figure and deliberately without fixed numerical boundary defined categories of noise risk from Negligible to High Risk as indicated / explained by the Figure 1 diagram of the ProPG document as reproduced on the following page.

It is important to note the “Noise Risk” relates to the potential adverse effect (to future occupiers) without noise mitigation measures being considered within a development’s scheme design, i.e. the noise risk assessment is for a residential development with nil acoustic design / mitigation consideration (no scheme of noise mitigation measures).

The ProPG assessment result of Low Noise Risk for the day period and Low / Medium Noise Risk for the night period correlates with the author’s subjective observations assessment and confirms the proposed residential development is acceptable from a noise perspective, provided that good acoustic design process is followed and demonstrated in an Acoustic Design Statement (ADS) to show how the potential adverse impacts of noise will be mitigated.

The scheme of proposed noise mitigation measures as detailed in Section 7 of this report provides an Acoustic Design Statement (ADS) for the development as indicated necessary by the ProPG document Site Noise Risk assessment.



7. SCHEME OF NOISE MITIGATION MEASURES

A scheme of mitigation measures to protect against external noise for residential developments may include consideration of aspects such as building positioning / orientation on the site's overall land extent, plus boundary treatments such as earth bunds and/or barriers / fences to provide acoustic screening against noise from road traffic, railways and/or other sources.

These considerations are generally more relevant and practicably applicable for proposed large scale multiple dwellings residential development schemes with large land extents and/or sites that are significantly / detrimentally noise affected with a ProPG assessment result into High Noise Risk categorisation.

The site is not adversely affected by very high noise levels and does not (need not) lend itself to consideration of the use of earth bunds and/or other types of very high physical acoustic barriers/screens to mitigate noise from traffic on London Road. In addition, high earth bunds and/or other types of acoustic barriers/screens would be out of context with existing surroundings.

As for most similar scenario residential developments, the scheme of noise mitigation measures relates principally to noise (sound) insulation performance for elements of the overall building envelope to protect against external noise ingress into rooms of the dwellings.

The dwellings' external walls and roof structure elements will by default, and regardless of construction type and specification, provide sufficient mitigation (insulation) against external noise ingress. The dominant path for external noise to enter rooms of the dwellings will be via glazing (windows) and any passive type ventilators.

An item-by-item scheme of advised noise mitigation measures for the dwellings' building envelope including specification for acoustic (sound insulation) performance of glazing and ventilation provision is provided in Sub-Sections 7.1 to 7.4. Assessment and comment for noise levels into external amenity space of the approved dwelling is provided in Sub-Section 7.5.

The scheme of noise mitigation measures is established and verified by following the rigorous calculation method procedure detailed in Section G.2 of Annex G (informative) of BS8233:2014.

Example BS8233:2014 rigorous procedure calculations for day and night period (as relevant) noise into the living room and bedroom 2 of House 1 are provided in Appendix D.

These sample rooms are as "worse case" for the development; both rooms are to the dwelling's west elevation as nearest to, and with windows overlooking, the adjacent B656 London Road; therefore subject to higher incident external noise levels than for other elevations and other dwellings of the development.

The calculations are for ventilation provision facilitated by Approved Document F Systems 1, 2 or 3. System 4 has greater mitigation against external noise by default (see sub-section 7.3 *Ventilation Provision* of the report).

The calculations use a spreadsheet based on Section G.2 of Annex G (informative) of BS8233:2014 and BS EN 12354-3:2000, this form of spreadsheet is used by many acoustic consultancy practices.

The rigorous procedure calculations verify the scheme of noise mitigation measures will ensure noise into rooms of the dwellings comply with the indoor ambient noise levels guidance of BS8233:2014.

It is important to note the calculations are cautious / robust based on “worse case” conditions. Actual noise levels into rooms of the dwellings are expected to be lower than indicated by the calculations for the following reasons:

- The calculations are based on survey noise levels measured at position of the overall development's dwelling façades nearest to the B656 London Road, with these levels taken as being externally incident upon all parts of the dwellings' external building envelopes. Noise levels from traffic on London Road externally incident on majority of the dwellings' external building envelopes will be lower than the values used in the calculations;
- The bedroom night period $L_{A_{fmax}}$ calculation is based on the measured typical highest regularly occurring $L_{A_{fmax}}$ noise level, occurring generally more than 10 times a night or several times in any one hour during the night. During majority of the night period, average / typical $L_{A_{fmax}}$ values are in the region at least circa 10 to 15dB lower, therefore night period levels into bedrooms for majority of the time will be substantially below the set noise limit of $L_{A_{fmax}}$ 45dB.

7.1 External Walls

As for the majority of residential development sites, the sound insulation performance for the dwellings' external walls is not critical. By default, most construction type external walls, and regardless of the specification of (thermal) insulation and/or plasterboard room-side linings, will provide more than adequate sound insulation to mitigate external noise into the rooms of the dwellings.

The developer has indicated external walls of the dwellings are to be conventional thermally insulated brick and block cavity construction with room-side plasterboard drylining.

Values in Table 2 show the expected minimum sound insulation performance for this form of external wall construction.

By default, this external wall construction and regardless of the specification type (thermal) cavity insulation and/or type plasterboard room-side linings, will provide more than adequate mitigation against external noise ingress for the dwellings.

It is unnecessary as part of the development's scheme of noise mitigation to specify any particular acoustic performance requirement or materials construction detail for the external walls.

Description	Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	4k
External Walls: Conventional insulated cavity masonry construction with plasterboard dry-lining room side Sound Reduction Index R dB	40	44	45	51	55 ⁽¹⁾	55 ⁽¹⁾
Note⁽¹⁾: Sound insulation limited to upper values 55dB. Higher sound reduction performance values likely by default at these frequencies but are not stated.						

Table 2: External walls sound insulation performance

7.2 Glazing

Values in Table 3 show the advised specification schedule for glazing acoustic performance to the proposed dwellings. Glazing includes windows, glazed exterior doors and roof lights.

Informative 2: Bedrooms' Glazing Acoustic Performance

The acoustic performance specification for glazing to bedrooms is uplifted (higher) as compared with that for glazing to living rooms and other parts of the dwellings.

This is driven by compliance with the bedrooms' night period (11pm to 7am) noise limit of $L_{A\max}$ 45dB; i.e. specifically to protect bedrooms against night period $L_{A\max}$ noise.

In addition, because night period $L_{A\max}$ noise levels potentially include contributions from occasional aircraft which affects the whole development extent equally (i.e. not more to the front – west elevation as the case for traffic noise), then the same specification glazing for bedrooms is advised applicable for bedrooms throughout the development.

The same also applies for noise mitigation consideration associated with ventilation provision to the bedrooms as detailed in Sub-Section 7.3.

Description	Octave Band Centre Frequency (Hz)						Comment
	125	250	500	1k	2k	4k	
Bedrooms	20	25	35	38	40 ⁽¹⁾	40 ⁽¹⁾	Overall performance $\geq$ Rw 36dB. Asymmetric double glazing; acoustic performance laminated acoustic grade 6mm or 8mm glass / airgap / 4mm glass configuration.
All other room types & areas (including living rooms)	17	17	25	35 ⁽¹⁾	35 ⁽¹⁾	30	Overall performance $\geq$ Rw 29dB. Default minimum acoustic performance, achieved using conventional thermal double glazing, typically such as minimum 4mm glass / airgap / 4mm glass configuration.
Note⁽¹⁾: Values limited to 40dB & 35dB depending on specification. Higher sound reduction performance values likely by default at these frequencies but need not be specified.							

Table 3: Specification for glazing acoustic performance, Sound Reduction Index R dB

The specified glazing sound insulation performance is applicable for the glazing system as a whole, i.e. including framework. The glazing is to have effective acoustic seals all round, typically such as rubber or neoprene beaded type that compress all around on closure of the windows and are maintenance replaceable.

The glazing sound insulation specification for windows to bedrooms corresponds to a high acoustic performance necessitating use of (as minimum) asymmetric configuration double glazed windows incorporating laminated acoustic grade glass. Asymmetric acoustic performance double glazing capable of compliance with the specification for bedrooms would (as minimum) be such as laminated acoustic grade 6mm or 8mm glass / airgap / 4mm glass configuration.

The glazing sound insulation specification for all other room types including living rooms of the dwellings corresponds to using conventional type double glazing minimum 4mm glass / airgap / 4mm glass configuration with default overall performance $\geq$ Rw 29dB (from BS EN 12758: Glass In Building - Glazing & Airborne Sound Insulation).

7.3 Ventilation Provision

Informative 3: Scope Of Ventilation Provision Within Assessment & Noise Mitigation Scheme

Details in this report and Sub-Section 7.3 are with respect to the noise aspect associated with ventilation provision for the proposed development dwellings.

Adequacy of ventilation provision in of itself and in respect to compliance with Building Regulations Approved Documents or other guidance (i.e. such as ventilation airflow change rates etc) is outside the scope of a noise assessment / scheme for noise mitigation and would be by others, typically by the project architect and/or developer in conjunction with ventilation product suppliers and the development's appointed Building Control Body.

This aspect is unavoidably complex due to current guidance and the differing ventilation provision systems / methods available for use. Therefore to assist in the consideration of this and to include advice for the necessary ventilation provision details as part of the development's scheme of noise mitigation measures in a straight-forward a way as possible, assessment of the development in respect to ventilation provision associated noise issues is provided in further titled Sub-Sections below and on the following pages.

7.3.1 Overview - Ventilation Provision & Noise Mitigation

It is expected the new dwellings will require mandatory ventilation and overheating consideration as per the provisions of Building Regulations Approved Document F (Ventilation) and Building Regulations Approved Document O (Overheating).

Full title of the relevant current edition of Document F is “*The Building Regulations 2010 Approved Document F Ventilation – Volume 1: Dwellings, Requirement F1 Means of Ventilation (2021 edition)*”.

Full title of the current edition of Document O is “*The Building Regulations 2010 Approved Document O Overheating – Requirement O1 Overheating Mitigation (2021 edition)*”.

Typically, a developer is able to decide in outline terms an appropriate ventilation and overheating mitigation strategy / scheme for new dwellings in conjunction with advice and agreement from the appointed Building Control Officer or Approved Inspector as the relevant authority responsible for Building Regulations compliance issues of a residential development. Ventilation provision being typically facilitated as per one of the four system methods (System 1 to 4) outlined in Approved Document F.

This process may include input from the project acoustic consultant to determine whether, if passive ventilators are to be used as part of the scheme, they are required to be to a certain acoustic performance, or whether in the case of developments affected by very high external noise levels, use of a mechanical ventilation system would be appropriate / necessary.

As well as compliance with the mandatory ventilation provisions as Building Regulations Approved Document F, many Local Planning Authorities now additionally stipulate (often as part of a development's planning approval process) a requirement with regard to the potential issue of excessive external noise ingress into dwellings through reliance on open windows conditions as may be associated with thermal comfort.

A typical Local Planning Authority requirement in this respect is such as “...*alternative forms of ventilation* (i.e. as alternative to reliance on open windows) *should be provided so that an occupant can choose to keep the noise out whilst having sufficient ventilation when windows are closed...*”.

7.3.2 Open Windows Noise Assessment

To determine any requirement for alternative forms of ventilation (i.e. as alternative to reliance on open windows) it is necessary to assess noise ingress into the proposed dwellings under open windows conditions.

It is well documented in many acoustic texts and other documents that the overall ambient noise level within a residential room with windows open is circa 10 to 15dB lower than the prevailing noise level immediately external (i.e. outside of) the room.

The Acoustic Ventilation and Overheating Residential Design Guide January 2020 (*AVO document*) advises using a value of 13dB lower.

Thus, for the dwellings to be compliant with the indoor noise levels guidance of BS8233:2014 with windows open, means that the external noise climate must be no higher than circa 13dB above the indoor noise levels guidance.

This is summarised in Table 4, separately for living rooms and bedrooms plus for the day and night period as relevant.

Room Type	Day Period (7am to 11pm)		Night Period (11pm to 7am)	
	Internal Noise Criterion / Limit	Noise Level Externally (requirement for compliance with open windows)	Internal Noise Criterion / Limit	Noise Level Externally (requirement for compliance with open windows)
Living Areas	≤35dB $L_{Aeq,16hour}$	≤48dB $L_{Aeq,16hour}$		
Bedrooms	≤35dB $L_{Aeq,16hour}$	≤48dB $L_{Aeq,16hour}$	≤30dB $L_{Aeq,8hour}$ ≤45dB L_{AFmax}	≤43dB $L_{Aeq,8hour}$ ≤58dB L_{AFmax}

Table 4: External noise levels requirement for compliance with indoor noise levels guidance with open windows

Assessment of the noise survey results against the values in Table 4 indicates noise levels externally to the site are above the requirement for compliance with the indoor noise levels guidance with open windows. Therefore it is necessary to include for an alternative form of ventilation (i.e. as alternative to reliance on open windows) as part of the proposed development's scheme of noise mitigation measures.

It is important to note the requirement for alternative means of ventilation is not because the site is affected by high or excessive noise levels. It is more because that compliance with the noise levels guidance under open windows conditions requires an extremely low noise climate for the day and night periods.

Regardless of whether a development site is within an urban, sub-urban or rural area and regardless of whether especially noise affected or not, very few residential development sites / locations have a noise climate sufficiently low (at or below the values in Table 4) for compliance allowing ventilation provision reliant solely on open windows.

7.3.3 AVO Document Guidance

This document is an applicable / valid information source in terms of establishing ventilation system acceptability for the proposed dwellings with respect to noise.

As described in Sub-Section 4.6 of this report, the AVO document is lengthy and technically complex, with significant background reference to relevant legislation and guidance including BS8322:2014 as well as description for the four ventilation system methods (System 1 to 4) outlined in Building Regulations Approved Document F (Ventilation).

However, and specifically in terms of establishing an appropriate ventilation system / strategy for residential dwellings, Table B-3 within Appendix B – *Example Application Of This Guide* of the AVO document provides guidance.

The guidance sets out which of the four ventilation system methods of Approved Document F would be appropriate depending on the magnitude of external noise levels.

It is important to note the AVO document guidance does not stipulate any fixed prescriptive form of ventilation system / strategy as should be used for dwellings in any given noise scenario. Thus, it is not the case that given certain noise levels as affecting this (or any other) residential development site, then a certain ventilation system / strategy be used.

The guidance is provided as authoritative advice, outlining the various ventilation system / strategy options and whether they be appropriate, depending on the magnitude of external noise a development site is exposed to.

Assessment of the approved development as per the guidance of AVO document Table B-3 is provided in Table 5 on the following page.

The assessment includes determination for which of the four ventilation system methods of Approved Document F would be appropriate / acceptable for the dwellings' living rooms and bedrooms as then compliant with the indoor noise levels guidance of BS8233:2014.

Consultants in Noise & Vibration
Building Regulations Certification Sound Insulation Testing

Approved Document F Ventilation System	Ventilation System Outline Description	External Noise Limits ⁽¹⁾	Proposed Development Dwellings Ventilation System Acceptability
1 or 2	System 1: Passive type trickle ventilators & intermittent extract fans (typically to bathroom & kitchen hob)	With standard double glazing & standard trickle ventilators: ≤56dB <i>L</i> _{Aeq,16hour} day period ≤51dB <i>L</i> _{Aeq,8hour} night period ≤67dB <i>L</i> _{AFmax} night period	Living Rooms - YES Bedrooms – NO
	System 2: Passive stack ventilation (no mechanical components specifically as part of the system)	With acoustic performance glazing & acoustic trickle ventilators: ≤66dB <i>L</i> _{Aeq,16hour} day period ≤61dB <i>L</i> _{Aeq,8hour} night period ≤80dB <i>L</i> _{AFmax} night period	Living Rooms - YES Bedrooms - YES
3	Passive type trickle ventilators & continuous mechanical extract (MEV)	With standard double glazing & standard trickle ventilators: ≤58dB <i>L</i> _{Aeq,16hour} day period ≤53dB <i>L</i> _{Aeq,8hour} night period ≤69dB <i>L</i> _{AFmax} night period	Living Rooms - YES Bedrooms – NO
		With acoustic performance glazing & acoustic trickle ventilators: ≤68dB <i>L</i> _{Aeq,16hour} day period ≤63dB <i>L</i> _{Aeq,8hour} night period ≤83dB <i>L</i> _{AFmax} night period	Living Rooms - YES Bedrooms - YES
4	Continuous mechanical supply & extract (typically such as MVHR system), no trickle ventilators	With standard double glazing: ≤62dB <i>L</i> _{Aeq,16hour} day period ≤57dB <i>L</i> _{Aeq,8hour} night period ≤76dB <i>L</i> _{AFmax} night period	Living Rooms - YES Bedrooms – YES
		With acoustic performance glazing: ≤73dB <i>L</i> _{Aeq,16hour} day period ≤68dB <i>L</i> _{Aeq,8hour} night period ≤90dB <i>L</i> _{AFmax} night period	Living Rooms - YES Bedrooms - YES
Note⁽¹⁾: The external noise limits day period values are applicable for living areas & bedrooms, the night period values are applicable for bedrooms. The external noise limits values are the approximate guideline free-field external noise limits as stated in Table B-3 Appendix B of the AVO Document; for System 1 with allowance of 2 x trickle ventilators per room & for System 3 with allowance of 1 x trickle ventilator per room.			

Table 5: Assessment to establish ventilation system acceptability for the development

Assessment in Table 5 as per guidance of the AVO document shows either of the four system methods outlined in Approved Document F would be appropriate / acceptable for the dwellings in terms of noise mitigation, subject to use of acoustic performance glazing and acoustic ventilators as necessary.

Therefore, it is advised the developer is able to select which ventilation provision system method be used, with the decision being based on other (i.e. not noise) factors.

7.3.4 Development Ventilation System & Acoustic Specification

Advised ventilation system acoustic specification details for the proposed dwellings are provided in Table 6.

The specification includes each of the Approved Document F ventilation systems as acceptable / applicable for the dwelling established by the assessment in Table 5 on the previous page plus with consideration of glazing acoustic performance as detailed in Sub-Section 7.2 of the report.

Description	Octave Band Centre Frequency (Hz)						Comments
	125	250	500	1k	2k	4k	
<u>System 1 Approved Document F</u> (passive trickle ventilators & intermittent extract fans) Or <u>System 2 Approved Document F</u> (passive stack ventilation – with passive trickle ventilators) Or <u>System 3 Approved Document F</u> (passive trickle ventilators & continuous mechanical extract – MEV system)							
Bedrooms	39	38	31	44	43	40	<u>Acoustic Performance Ventilators:</u> Greenwood acoustic ventilators 5000EAW.AC1 (or equivalent) overall performance $D_{n,e,w}$ 39dB open
Living Rooms & other room types / areas	30	30	30	30	30	30	Conventional / standard non-acoustic ventilators acceptable, by default have overall performance typically $\geq D_{n,e}$ 30dB open
<u>System 4 Approved Document F</u> (MVHR system - continuous mechanical supply & extract)							
System 4 ventilation does not include passive / trickle ventilators. System 4 ventilation would be acceptable for the dwellings subject to compliance with the mechanical system specification noise limits detailed in Table 7							

Table 6: Ventilator acoustic specification, Normalised Level Difference $D_{n,e}$ dB (open position)

The acoustic ventilator specification to the dwelling bedrooms (applicable for ventilation provision as Approved Document F Systems 1 to 3) is based on a commonly used / widely available proprietary high performance acoustic ventilator - Greenwood acoustic ventilators product code 5000EAW.AC1.

Other supplier and/or model acoustic ventilators would be acceptable (equivalent) for the dwelling bedrooms providing that the selected acoustic ventilator (open position) has overall $D_{n,e,w}$ dB performance and individual octave band Normalised Level Difference $D_{n,e}$ dB performance not less than those specified in Table 6.

If using System 4 MVHR, then ventilation system associated mechanical component specification noise limits are provided in Table 7 on the following page. The specification is based on the guidance of Figure 3-4 *Indoor Ambient Noise Levels From Mechanical Services – ADF Condition* from Section 3 *Internal Ambient Noise level Guidelines* of the AVO document.

The mechanical component noise limits are to ensure that noise generated by the system itself; i.e. noise from a mechanical ventilation (MVHR) system's fan and any other associated components does not cause unacceptable / undesirable noise levels within rooms of dwellings.

Where self-noise from a mechanical system can potentially exceed these limits then noise of the system would be sufficiently reduced typically by using in-line ductwork attenuators (silencer) or acoustic type flexible ducting as opposed to standard type ducting between the mechanical system unit and individual room grilles.

Ventilation Condition	Ventilation System	Desirable Internal Ambient Noise Level From Mechanical Services
Approved Document F: Whole Dwelling Ventilation	System 3: Continuous mechanical extract (MEV), minimum low ventilation rate System 4: Continuous mechanical supply & extract (MVHR), minimum low ventilation rate	Bedrooms $\leq 26\text{dB } L_{Aeq}$ Living Areas $\leq 30\text{dB } L_{Aeq}$
Approved Document F: Extract Ventilation	System 1: Intermittent extract fans System 3: Continuous mechanical extract (MEV), minimum high ventilation rate System 4: Continuous mechanical supply & extract (MVHR), minimum high ventilation rate	Bedrooms $\leq 26\text{dB } L_{Aeq}$ Living Areas $\leq 35\text{dB } L_{Aeq}$ Bathrooms / WCs $\leq 45\text{dB } L_{Aeq}$
Approved Document F: Purge Ventilation	As per guidance of the AVO document, no internal ambient noise levels are applied under purge ventilation conditions	

Table 7: Ventilation system mechanical component acoustic specification (system self-noise limits)

7.4 Roof & Associated Ceilings

Roof structures of the dwellings are to be formed by a conventional tiles over thermally insulated loft / rafters pitched roof construction.

Values in Table 8 show the expected minimum sound insulation performance for this form of roof construction plus with single layer standard type plasterboard ceilings roomside below.

It is unnecessary as part of the development's scheme of noise mitigation measures to specify any particular acoustic performance or construction type / materials for the dwellings' roof structure and associated ceilings.

Description	Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	4k
Roof & Associated Ceilings: Conventional tiled / insulated pitched roof structure + single layer plasterboard ceilings below Sound Reduction Index R dB	24	34	40	45	49	50 ⁽¹⁾
Note⁽¹⁾: Sound insulation limited to upper values 50dB. Higher sound reduction performance values likely by default at these frequencies but are not stated.						

Table 8: Roof & associated ceilings sound insulation performance

7.5 External Amenity Space

External amenity space of the proposed development relates to private rear garden areas of the dwellings.

Results of the survey show a day period noise level $L_{Aeq,T}$ 55dB, externally to front elevation of the development site overlooking London Road. Noise levels to the rear part of the development site (to rear of the existing buildings and as directly representative for gardens areas to the new dwellings) are pro-rata at least 5 to 8dB lower.

Overall day period noise levels to within the rear private gardens of the new dwellings are therefore expected to be at or below $L_{Aeq,T}$ 50dB and compliant with the guidance of BS8233:2014 for noise levels within external amenity space as outlined in Sub-Section 4.3 of the report; *"it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ ".*

No noise mitigation measures are required specifically in respect to external amenity space of the proposed development dwellings.

A P P E N D I X A

Aerial Image, Proposed Site Plan & Floor Plan Layout Drawings

Site: Greenbanks, London Road, St Ippolyts, Hitchin SG4 7NJ

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AERIAL IMAGE



Site: Greenbanks, London Road, St Ippolyts, Hitchin SG4 7NJ

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PROPOSED SITE PLAN



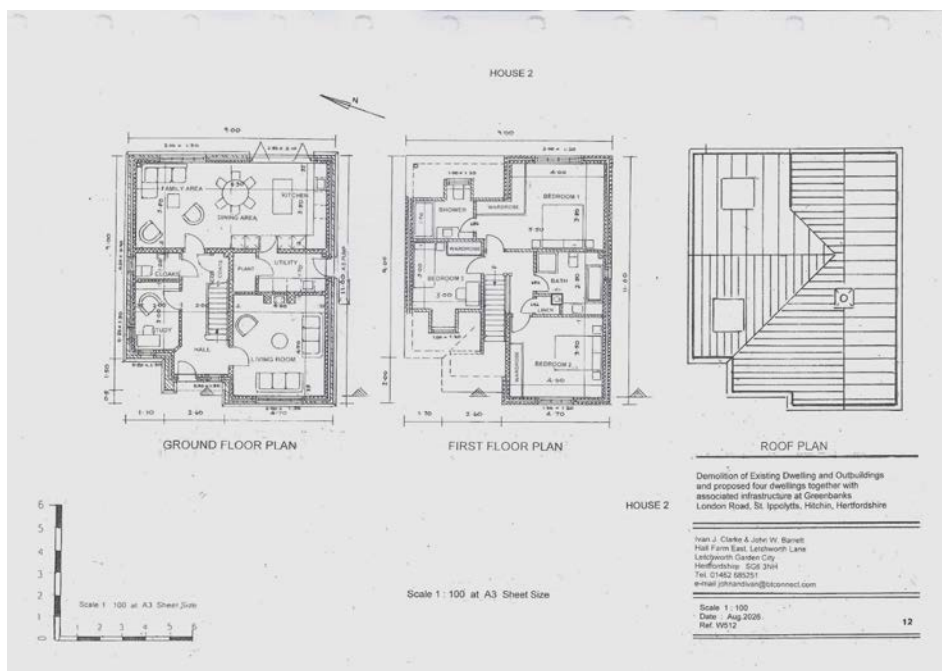
Indicates 3-day primary noise survey position; selected "worse-case" representative of externally at west elevation façades of proposed development Houses 1 & 4 as nearest to the B656 London Road (landscaping / planting in proximity of survey position as shown on this proposed site plan not currently in place)

Site: Greenbanks, London Road, St Ippolyts, Hitchin SG4 7NJ

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PROPOSED FLOOR PLAN LAYOUT DRAWINGS (House 1 & House 2)

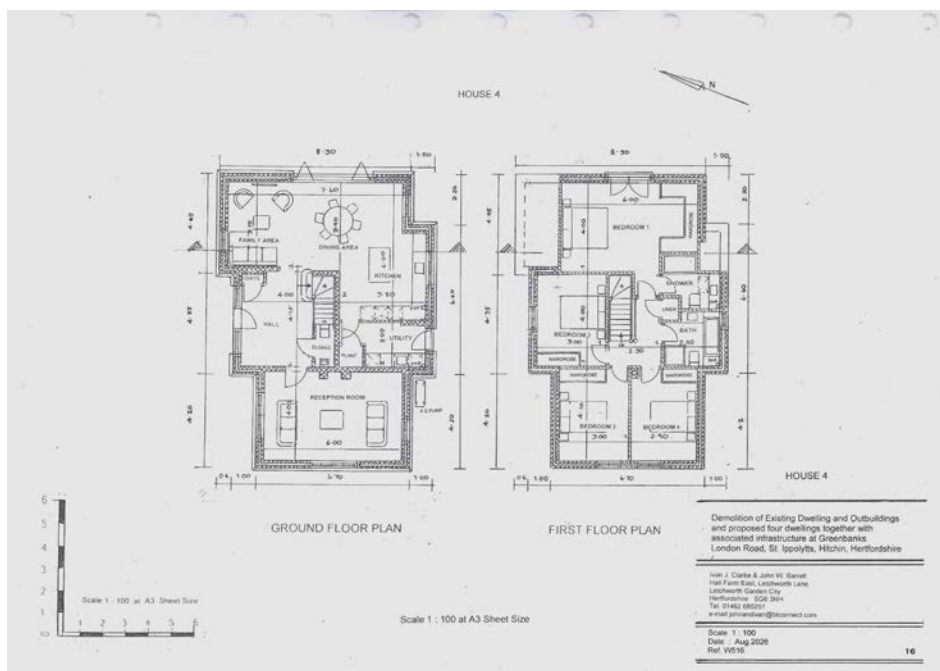
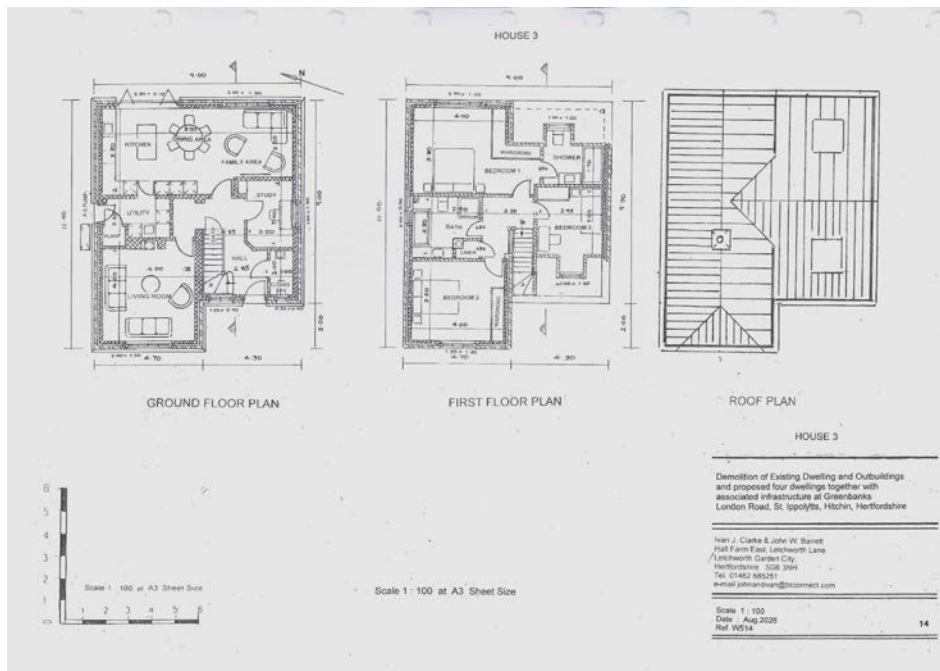


Site: Greenbanks, London Road, St Ippolyts, Hitchin SG4 7NJ

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Date: September 2026

PROPOSED FLOOR PLAN LAYOUT DRAWINGS (House 3 & House 4)



A P P E N D I X B

Noise Survey Instrumentation

Site: Greenbanks, London Road, St Ippolyts, Hitchin SG4 7NJ

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Date: September 2026

NOISE SURVEY INSTRUMENTATION

Primary Position Three Day Survey 17/06/2026 – 19/06/2026

Instrumentation Used:

- Rion sound level meter type NL-31 Class 1, Rion preamplifier type NH-21, Rion microphone type UC-53A, Rion microphone windshield type WS-10, Rion microphone extension cable type EC-04A and tripod / boom arrangement;
- Bruel & Kjaer calibrator type 4231;
- Speedtech Instruments Skymaster model SM-28 serial number 19370 (sample weather conditions data).

Instrumentation Calibration Certification:

Description	Type Number	Manufacturer	Date of Calibration Expiration	Calibration Certificate Number
Class 1 Sound Level Meter s/n 00773045	NL-31	Rion	21/02/2027	TCRT25/1163
Microphone s/n 313002	UC-53A			
Preamplifier s/n 25056	NH-21			
Calibrator s/n 2454786	4231	Bruel & Kjaer	04/02/2027	TCRT25/1079

Instrumentation On-Site Calibration Check:

Description	Calibrator Reference Level	Measured Level	Comment
Before survey measurements	94.0dB	94.0dB	Pass
After survey measurements		94.0dB	Pass (<i>nil drift</i>)

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Date: September 2026

NOISE SURVEY INSTRUMENTATION

Secondary Position & Sample Octave Band Levels Survey

Instrumentation Used:

- Bruel & Kjaer sound level meter type 2260 Class 1, Bruel & Kjaer preamplifier type ZC0026, Bruel & Kjaer microphone type 4189, Bruel & Kjaer windshield type UA 0237 & tripod;
- Bruel & Kjaer calibrator type 4231.

Instrumentation Calibration Certification:

Description	Type Number	Manufacturer	Date of Calibration Expiration	Calibration Certificate Number
Class 1 Sound Level Meter s/n 2497368	2260	Bruel & Kjaer	08/02/2027	TCRT25/1115
Microphone s/n 2625249	4189			
Preamplifier s/n 3268	ZC0026			
Calibrator s/n 2454786	4231	Bruel & Kjaer	04/02/2027	TCRT25/1079

Instrumentation On-Site Calibration Check:

Description	Calibrator Reference Level	Measured Level	Comment
Before survey measurements	94.0dB	93.9dB	Pass
After survey measurements		93.9dB	Pass (nil drift)

APPENDIX C

Noise Survey Results

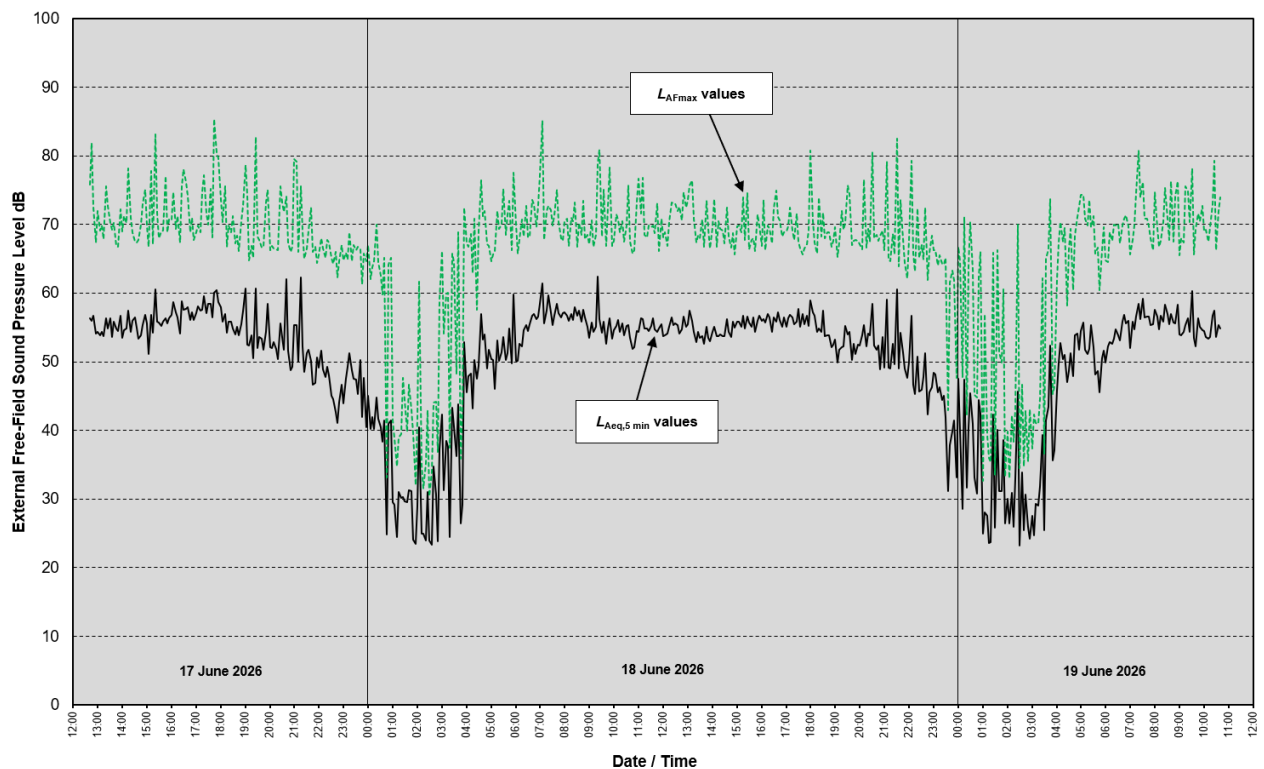
Site: Greenbanks, London Road, St Ippolyts, Hitchin SG4 7NJ

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NOISE SURVEY RESULTS

Primary Position Three Day Survey 17/06/2026 – 19/06/2026



APPENDIX D

BS8233:2014 Annex G Rigorous Procedure Calculations

Site: Greenbanks, London Road, St Ippolyts, Hitchin SG4 7NJ

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Date: September 2026

BS8233:2014 ANNEX G RIGOROUS PROCEDURE CALCULATIONS

Sample Room: House 1 Living Room (ground floor west elevation, sample living room nearest to London Road)

Noise Condition: Day Period (07:00 to 23:00) External Free-Field $L_{Aeq,16hr}$ 55dB

Noise Criterion: Internal Ambient Noise Limit In Room $L_{Aeq,16hr} \leq 35dB$ (BS8233:2014 guidance)

Equivalent Free-Field External Sound Pressure Level Outside Sample Room :							
Day 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Leq,ff	55	60	54	50	51	46	42
Building Envelope Details For Sample Room :							
Element	Area (m ²) or Vent No	Element Specification / Description					
External Walls	29.4	Conventional insulated cavity brick & block external walls					
Glazing (w indow s)	4.2	Double glazing default acoustic performance ≥ Rw 29dB					
Exterior Doors	0	No exterior doors to room					
Roof	0	Ground floor room; no roof over room					
Ventilation Provision	4	ADF Systems 1-3 w ith standard ventilators default performance ≥ Dn,e 30dB (open position)					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m ²) or Vent No	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
External Walls	29.4	40	44	45	51	55	55
Glazing (w indow s)	4.2	17	17	25	35	35	30
Exterior Doors	0						
Roof	0						
Ventilation (Dn,e)	4	30	30	30	30	30	30
Overall Sound Reduction All Elements Combined		-24.2	-24.3	-27.9	-29.1	-29.1	-28.8
Sample Room Volume (m ³):		58					
Sample Room Building Envelope Surface Area (m ²):		33.6					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Living Room	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Reverberation Time In Furnished Sample Room		0.50	0.50	0.45	0.40	0.40	0.40
Calculated Internal Sound Pressure Level In Sample Room :							
Day 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Leq,2	32	41	35	27	27	22	18

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BS8233:2014 ANNEX G RIGOROUS PROCEDURE CALCULATIONS

Sample Room: House 1 Bedroom 2 (first floor west elevation, sample bedroom nearest to London Road)

Noise Condition: Day Period (07:00 to 23:00) External Free-Field $L_{Aeq,16hr}$ 55dB

Noise Criterion: Internal Ambient Noise Limit In Room $L_{Aeq,16hr} \leq 35dB$ (BS8233:2014 guidance)

Equivalent Free-Field External Sound Pressure Level Outside Sample Room :							
Day 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Leq,ff	55	60	54	50	51	46	42
Building Envelope Details For Sample Room :							
Element	Area (m²) or Vent No	Element Specification / Description					
External Walls	5.8	Conventional insulated cavity brick & block external walls					
Glazing (window s)	1.7	Acoustic grade asymmetric configuration double glazing overall performance ≥ Rw 36dB					
Exterior Doors	0	No exterior doors to room					
Roof	38	Conventional thermal insulated double pitch tiled roof + single layer plasterboard ceiling below					
Ventilation Provision	2	Acoustic ventilators; Greenw ood 5000EAW.AC1 (or equivalent) Dn,e,w 39dB open					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m²) or Vent No	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
External Walls	5.8	40	44	45	51	55	55
Glazing (window s)	1.7	17	17	25	35	35	30
Exterior Doors	0						
Roof	38	24	34	40	45	49	50
Ventilation (Dn,e)	2	30	30	30	30	30	30
Overall Sound Reduction All Elements Combined		-23.4	-28.2	-31.9	-33.2	-33.4	-33.1
Sample Room Volume (m³):		42					
Sample Room Building Envelope Surface Area (m²):		45.5					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Bedroom	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Reverberation Time In Furnished Sample Room		0.40	0.40	0.35	0.30	0.30	0.30
Calculated Internal Sound Pressure Level In Sample Room :							
Day 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Leq,2	31	44	33	25	24	19	15

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BS8233:2014 ANNEX G RIGOROUS PROCEDURE CALCULATIONS

Sample Room: House 1 Bedroom 2 (first floor west elevation, sample bedroom nearest to London Road)

Noise Condition: Night Period (23:00 to 07:00) External Free-Field $L_{Aeq,16hr}$ 50dB

Noise Criterion: Internal Ambient Noise Limit In Room $L_{Aeq,8hr} \leq 30dB$ (BS8233:2014 guidance)

Equivalent Free-Field External Sound Pressure Level Outside Sample Room :							
Night 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Leq,ff	50	56	50	45	46	41	38
Building Envelope Details For Sample Room :							
Element	Area (m ²) or Vent No	Element Specification / Description					
External Walls	5.8	Conventional insulated cavity brick & block external walls					
Glazing (window s)	1.7	Acoustic grade asymmetric configuration double glazing overall performance ≥ R _w 36dB					
Exterior Doors	0	No exterior doors to room					
Roof	38	Conventional thermal insulated double pitch tiled roof + single layer plasterboard ceiling below					
Ventilation Provision	2	Acoustic ventilators; Greenwood 5000EAW.AC1 (or equivalent) D _{n,e,w} 39dB open					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m ²) or Vent No	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
External Walls	5.8	40	44	45	51	55	55
Glazing (window s)	1.7	17	17	25	35	35	30
Exterior Doors	0						
Roof	38	24	34	40	45	49	50
Ventilation (D _{n,e})	2	30	30	30	30	30	30
Overall Sound Reduction All Elements Combined		-23.4	-28.2	-31.9	-33.2	-33.4	-33.1
Sample Room Volume (m ³):		42					
Sample Room Building Envelope Surface Area (m ²):		45.5					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Bedroom	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Reverberation Time In Furnished Sample Room		0.40	0.40	0.35	0.30	0.30	0.30
Calculated Internal Sound Pressure Level In Sample Room :							
Night 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Leq,2	27	40	29	20	19	14	11

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BS8233:2014 ANNEX G RIGOROUS PROCEDURE CALCULATIONS

Sample Room: House 1 Bedroom 2 (first floor west elevation, sample bedroom nearest to London Road)

Noise Condition: Night Period (23:00 to 07:00) External Free-Field $L_{A\text{fmax}}$ 72dB (typical regular occurring high value)

Noise Criterion: Internal Noise Limit In Room $L_{A\text{fmax}} \leq 45\text{dB}$

Equivalent Free-Field External Sound Pressure Level Outside Sample Room :							
Night 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Typical Regular High Lfmax,ff	72	73	68	69	67	65	57
Building Envelope Details For Sample Room :							
Element	Area (m²) or Vent No	Element Specification / Description					
External Walls	5.8	Conventional insulated cavity brick & block external walls					
Glazing (window s)	1.7	Acoustic grade asymmetric configuration double glazing overall performance ≥ Rw 36dB					
Exterior Doors	0	No exterior doors to room					
Roof	38	Conventional thermal insulated double pitch tiled roof + single layer plasterboard ceiling below					
Ventilation Provision	2	Acoustic ventilators; Greenwood 5000EAW.AC1 (or equivalent) Dn,e,w 39dB open					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m²) or Vent No	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
External Walls	6	40	44	45	51	55	55
Glazing (window s)	1.7	20	25	35	38	40	40
Exterior Doors	0						
Roof	38	24	34	40	45	49	50
Ventilation (Dn,e)	2	39	38	31	44	43	40
Overall Sound Reduction All Elements Combined		-24.2	-32.8	-33.5	-42.9	-44.4	-42.5
Sample Room Volume (m³):		42					
Sample Room Building Envelope Surface Area (m²):		45.5					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Bedroom	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Reverberation Time In Furnished Sample Room		0.40	0.40	0.35	0.30	0.30	0.30
Calculated Internal Sound Pressure Level In Sample Room :							
Night 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz
Lfmax,2	43	56	42	42	30	27	21