Philip Acoustics Ltd.

Consultants in Noise & Vibration
Building Regulations Certification Sound Insulation Testing

REPORT TITLE: NOISE ASSESSMENT & SCHEME OF NOISE PROTECTION MEASURES FOR APPROVED FLATS AT 17-19 LONG LANE, ICKENHAM UB10 8QU

London Borough of Hillingdon Reference: 29266/APP/2021/2026 Condition 6 (noise)

REPORT REF: 24007-002

ISSUED TO: Towers Associates

ISSUED BY: David R Philip BEng (Hons) MIOA

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PHILIP ACOUSTICS LTD Registered in England No.: 4560265
Office: 107 Bancroft, Hitchin, Hertfordshire SG5 1NB
Tel: 01462 431877 Email: admin@philipacoustics.co.uk
Member of The Association of Noise Consultants

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SUMMARY

- London Borough of Hillingdon as Local Planning Authority has granted approval for a residential flats' development at 17-19 Long Lane, Ickenham UB10 8QU. The approval decision notice is London Borough of Hillingdon planning application reference 29266/APP/2021/2026 issue date 14 July 2021.

- The approved development is for two studio flats formed by the conversion of roof space to habitable use above two existing first floor residential flats within the property.

- Condition 6 attached to the approval requires that a scheme of noise protection measures for the development be submitted to, and approved by, the Local Planning Authority. Condition 6 is imposed for reason to protect occupiers of the approved flats from noise associated with ground floor commercial use at 17-19 Long Lane. The ground floor commercial use at 17-19 Long Lane is Ickenham Motor Company.

- This report provides a noise assessment and scheme of noise protection measures for the approved development flats as required by Condition 6.

- The noise assessment and scheme of noise protection measures is with reference to relevant current guidance and standards including British Standard BS8233:2014 *"Guidance on Sound Insulation and Noise Reduction for Buildings"* plus also document ProPG "*Planning & Noise New Residential Development*".

- As part of the assessment process an extended seven-day period noise survey has been conducted at the development site to include multiple sample weekdays and a sample Saturday for times of opening of the ground floor commercial use Ickenham Motor Company.

- Using results of the survey, an assessment of the development site as per the Noise Risk Assessment methodology of the ProPG document has been carried out. The assessment shows the site categorised as Negligible / Low Noise Risk. This correlates with subjective observations of the author as detailed in the report; site of the approved flats is not especially noise affected by the ground floor commercial use at 17-19 Long Lane (Ickenham Motor Company).

- As required by Condition 6 a scheme of noise protection measures for the approved flats is established and included in Section 7 of the report. The scheme of noise protection measures is verified using the rigorous calculation procedure outlined in Section G.2, Annex G (informative) of BS8233:2014 and includes specification for the acoustic performance of glazing and ventilation provision to the approved flats.

1. INTRODUCTION

London Borough of Hillingdon as Local Planning Authority has granted approval for a residential flats' development at 17-19 Long Lane, Ickenham UB10 8QU.

The development is for two studio flats formed by the conversion of roof space to habitable use above two existing first floor residential flats within the property.

The approval decision notice is London Borough of Hillingdon planning application reference 29266/APP/2021/2026 with issue date 14 July 2021.

Condition 6 attached to development's approval is with respect to protection of amenity for occupiers of the development flats against noise and is reproduced below:

> 6 Prior to the commencement of works above ground floor level, a scheme for protecting the proposed development from noise associated with the ground floor commercial uses at 17-19 Long Lane shall be submitted to and approved in writing by the Local Planning Authority. All works which form part of the scheme shall be fully implemented before the development is occupied and thereafter shall be retained and maintained in good working order for so long as the building remains in use.
>
> REASON
> To ensure that the amenity of the occupiers of the proposed development is not adversely affected by noise from the neighbouring commercial uses in accordance with policy DMHB 11 of the Hillingdon Local Plan Part 2 (2020) and Policies D13 and D14 of the London Plan (2021).

This report provides a noise assessment including scheme of noise protection measures for the approved flats development as required by Condition 6 and includes:

- Qualifications & experience;
- Description of the approved development;
- Noise assessment methodology & criteria, with reference to 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;
- Condition 6 scheme of noise protection 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 30 years' experience as an Acoustic Consultant both in the UK and internationally and has considerable experience conducting 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 protection / mitigation measures specifically associated with change of use (conversion) and new-build residential developments in urban location mixed use commercial/retail and residential areas.

David Philip is fully familiar with the provisions of the current (and previous) editions of British Standard BS8233, as well as other acoustics related relevant standards and guidance documents.

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

17-19 Long Lane (the site) is an existing mixed use two storey building, comprising commercial use at ground floor and two existing residential flats at first floor.

The building forms part of a parade of similar mixed use properties, with commercial / retail uses at ground floor and residential flats over upper floors above.

The ground floor commercial use at 17-19 Long Lane (i.e. as directly below the existing first floor flats) is a car sales showroom for Ickenham Motor Company.

Ickenham Motor Company also undertake vehicle MOT and servicing from the premises. This work is conducted within a separate workshop located at ground floor to the rear of the property. Vehicular access to the workshop is via Edinburgh Drive off Glebe Avenue beyond the rear of the site.

The existing first floor flats (and approved flats above) are not located above the vehicle MOT and servicing workshop.

The ground floor commercial use (i.e. Ickenham Motor Company) has opening hours 8am to 5pm Monday to Friday and 8am to 3pm Saturdays.

An aerial image and site location plan indicating the development's location in respect to roads and properties in the vicinity are provided in Appendix A. These are annotated to show position for the separate MOT and servicing workshop of Ickenham Motor Company to the rear.

The approved development is for two studio flats formed by conversion of roof space to habitable use above two existing first floor residential flats within the property.

The planning approval full description of the development is:

> *"Conversion of roofspace to habitable use and external alterations to the building to create 2 x studio flats involving infilling of space between the existing rear projections and installation of 2 dormers to rear and 4 front rooflights"*.

Copy of the approved development proposed plan and elevations drawings are also provided in Appendix A.

4. NOISE ASSESSMENT METHODOLOGY & CRITERIA

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

4.1 Government National Planning Policy Guidance

4.1.1 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 4.1.2.

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 4.1.2.

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 4.2 & 4.4 respectively.

4.1.2 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 2023.

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.

4.2 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 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	≤35dB $L_{Aeq,16hour}$	
Dining	Dining room/area	≤40dB $L_{Aeq,16hour}$	
Sleeping (daytime resting)	Bedroom	≤35dB $L_{Aeq,16hour}$	≤30dB $L_{Aeq,8hour}$

The ground floor commercial use at 17-19 Long Lane does not operate during the night period and therefore in the context of Condition 6, the day period guidance values of BS8233:2014 as detailed above would be appropriate / relevant applied as noise criteria for the approved development flats.

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 approved flats do not have external amenity space and therefore it is unnecessary to consider the guidance of BS8233:2014 in this respect.

4.3 British Standard BS4142

In the scenario of a proposed residential development site (and/or existing residential premises) affected by a specific, dominant and/or otherwise significant commercial and/or industrial type noise 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*".

4.4 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 approved flats 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 a Site Noise Risk Assessment, intended for use before a proposed residential development's planning submission. Notwithstanding the development is approved, Section 6 of this report uses the noise survey results to include a Site Noise Risk Assessment for the development as per guidance of the ProPG document.

4.5 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 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 Document Part F (Ventilation).

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 is included in sub-section 7.2 *Ventilation Provision* of the report.

5. NOISE LEVELS SURVEY

The author has conducted site inspection visits and a noise levels measurement survey as part of the assessment process plus to inform a scheme for noise protection measures for the approved development flats as required by Condition 6. Details of the survey are provided in the following sections.

5.1 Survey Preliminaries

Condition 6 relates specifically to protection for the approved flats from noise associated with ground floor commercial uses at 17-19 Long Lane.

As detailed in Section 3. *Development Description*, ground floor commercial uses at 17-19 Long Lane are Ickenham Motor Company's car showroom and workshop with opening hours 8am to 5pm Monday to Friday and 8am to 3pm Saturdays.

The showroom use occupies the front main part of the building 17-19 Long Lane, directly below the existing first floor flats. The workshop is separate from the showroom, within a single storey rear extension to the main building.

In advance of the author's site inspection visit and noise survey it was considered there are three separate noise issues (noise transmission routes) associated with the ground floor commercial use as could potentially affect occupiers of the approved development flats:

a) **Noise Internally:** Noise from ground floor commercial uses at 17-19 Long Lane into the approved flats transmitting internally via the shared building's structure;

b) **Front Elevation External Noise:** Noise from ground floor commercial uses at 17-19 Long Lane transmitting externally into the approved flats via windows etc. to the front elevation overlooking Long Lane;

c) **Rear Elevation External Noise:** Noise from ground floor commercial uses at 17-19 Long Lane transmitting externally into the approved flats via windows etc. to the rear elevation.

During the author's site inspection visit as part of conducting the noise levels measurement survey it was immediately observed / established that noise associated with the ground floor commercial use Ickenham Motor Company as potentially affecting the approved flats relates solely to item **c)** rear elevation external noise.

Specifically noise from activity associated with Ickenham Motor Company's MOT and servicing workshop to the rear of the property, potentially transmitting externally from the workshop to the rear elevation of the approved flats.

Regarding item **a)**: No noise associated with the ground floor commercial use Ickenham Motor Company is observed (audible) or measurable within the existing first floor flats as may be transmitting internally via the shared building's structure.

This is due to that the ground floor use directly below the existing first floor flats is a showroom area and a very quiet / low noise environment, plus the MOT and servicing workshop is separate to the rear of the building (not directly below the flats).

Notwithstanding this observation, the approved development flats are at loft (new second floor) level above the existing first floor flats. Therefore the approved flats are even farther separated / distant from, plus with the existing first floor flats as a buffer between, the ground floor commercial use. There will be no noise from the ground floor commercial uses into the approved flats transmitting internally via the shared building's structure.

Regarding item **b)**: Noise externally to the front elevation of the property is due to frequent passing traffic in either direction on Long Lane. Ickenham Motor Company does not generate noise externally to the front elevation as would potentially affect the existing first floor flats and/or approved flats above.

5.2 Survey Details & Procedure

The noise measurement survey was conducted using a logging type sound level meter over a seven-day period from Tuesday 20 February 2024 through Monday 26 February 2024, to include multiple sample weekdays and a sample Saturday for times of opening / operation of the ground floor commercial use Ickenham Motor Company.

Weather conditions were monitored and for majority of the seven-day period were suitable for the noise survey (dry with light wind speed), i.e. not adversely contaminating / influencing the survey measurements.

The survey was conducted by positioning the measurement instrumentation microphone on a telescopic boom arrangement externally out from a rear elevation window of an existing first floor flat at the property. The rear elevation position was selected as representative "worse case" for the approved development flats potentially subject to noise contributions from activity associated with Ickenham Motor Company's MOT and servicing workshop to the rear of the property.

The survey position is indicated on the site plan in Appendix A.

Noise measurements were as 1m façade levels, in terms of continual 5-minute samples of $L_{Aeq,T}$ dB (T = *5 minutes*) values for the full survey duration. Other parameter noise level measurements including statistical values were recorded for information.

***Informative (1)*: Noise Survey Position**

Noise levels for assessment of proposed / approved residential development are generally measured 1.2 to 1.5m above ground level in equivalent free-field conditions, as typically applicable for bare / open land sites.

However for this site (as most urban location change of use / conversion residential developments), it was necessary / appropriate to measure noise levels at positions externally as 1m façade levels from an upper floor level of the building for reasons of security of the noise survey instrumentation and because the approved flats are at upper floor level of the building.

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

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.

5.3 Survey Results & Observations

Complete raw data results of the noise survey are provided in Appendix C.

***Informative (2)*: Analysis Of Noise Survey Results**

The ground floor commercial use Ickenham Motor Company has opening / operating hours 8am to 5pm Monday to Friday and 8am to 3pm Saturdays.

Notwithstanding this, and for completeness, analysis of the noise survey results is conducted for day periods and night periods including for the Sunday of the survey, i.e. the analysis includes periods of the survey with the ground floor commercial use closed and not potentially contributing any noise to the approved development flats.

Analysis of the noise survey results in terms of overall equivalent free-field $L_{Aeq,T}$ values for the separate day and night periods of completed whole days of the survey are shown in Table 1.

In accordance with normal noise assessment procedures plus guidance of paragraph 3.1.10 of BS8233:2014, the as measured 1m façade value raw data results in Appendix C are taken to be 2dB higher than equivalent free-field level values as required for use in the ProPG Site Noise Risk assessment plus also the BS8233:2014 Annex G rigorous procedure calculations to inform and verify the development's scheme of noise protection measures.

Description		**Overall Period Equivalent Free Field $L_{Aeq,T}$**
Wednesday 21 February 2024	Day period 07:00-23:00	52dB (16hour)
	Night period 23:00-07:00	48dB (8hour)
Thursday 22 February 2024	Day period 07:00-23:00	52dB (16hour)
	Night period 23:00-07:00	48dB (8hour)
Friday 23 February 2024	Day period 07:00-23:00	51dB (16hour)
	Night period 23:00-07:00	47dB (8hour)
Saturday 24 February 2024	Day period 07:00-23:00	51dB (16hour)
	Night period 23:00-07:00	46dB (8hour)
Sunday 25 February 2024	Day period 07:00-23:00	51dB (16hour)
	Night period 23:00-07:00	46dB (8hour)

Table 1: Approved development rear elevation external noise levels

The author observed no significant (minimal) noise contribution to the site from the ground floor commercial uses at 17-19 Long Lane including Ickenham Motor Company's MOT and servicing workshop.

This is principally because Ickenham Motor Company's MOT and servicing workshop is within a separate building to the rear of the property and also that the roller shutter door opening of the workshop is to the very rear of the workshop and facing away from the site, i.e. the workshop's door opening is facing towards Edinburgh Drive.

The rear elevation external noise climate at the site is predominantly due to underlying noise of traffic in the local and wider vicinity, albeit noise to the rear elevation does nevertheless potentially include some noise from workshop.

Noise levels are observed to be of relatively low magnitude and in terms of overall noise climate of mixed sources; but predominantly from traffic on roads in the local and wider vicinity.

Noise from activity within Ickenham Motor Company's MOT and servicing workshop is noticeable in proximity of the workshop along Edinburgh Drive (i.e. the road to the rear), but not at approved flats' development site.

This observation is confirmed / proven by analysis evidence of the day period noise survey results in Table 1 on the previous page and in Appendix C.

In simple overview terms, the survey results and analysis of the results shows noise levels to the site as not materially any different for when the ground floor commercial uses at 17-19 Long Lane (Ickenham Motor Company) is operating and when it is not.

The survey results do not display any noticeable uplift in noise levels during opening times of the commercial use as occurs in scenarios where a neighbouring commercial use does contribute noticeable / significant noise to a development site.

As example:

- Day period noise levels are consistent from day to day at $L_{Aeq,16hr}$ 51 – 52dB, regardless of whether the ground floor commercial use is operating or not; noise levels for the Sunday of the survey are not materially lower than weekdays or the Saturday;
- Noise levels during the morning between circa 6am to 8am and before the ground floor commercial use is open / operating are the same (comparable with) noise levels after 8am when the commercial use open / operating;
- Similarly, noise levels during the afternoon after the ground floor commercial use closes are the same (comparable with) noise levels during the afternoon with the commercial use is open / operating.

6. NOISE ASSESSMENT

***Informative (3)*: Assessment Of Noise Survey Results In Context Of Condition 6**

Condition 6 relates specifically to protection for the approved flats from noise associated with ground floor commercial uses at 17-19 Long Lane.

As indicated by the survey results / observations, noise to the approved development flats is predominantly due to underlying noise of traffic and does not include significant contributions of noise from the ground floor commercial uses including from activity within Ickenham Motor Company's MOT and servicing workshop.

Notwithstanding this, noise levels results of the survey as actual / measured are used for purpose of the ProPG noise assessment in this section, i.e. regardless that values are not representative solely of noise to the approved flats as associated with ground floor commercial uses (Condition 6) but are predominantly due to traffic in the local and wider vicinity.

In addition and as per the details above plus in Section 5.3 of the report, the approved development flats are not affected by specific, dominant and/or otherwise significant commercial noise from the ground floor uses at 17-19 Long Lane as would warrant separate additional assessment under the provisions of BS4142:2014.

In terms of a general subjective observations noise assessment based on experience of the author, noise levels to the rear elevation of the approved development site (as potentially affected by ground floor commercial uses) are low.

In overall planning context, day and night period noise levels externally to the rear elevation are in relative terms lower than those to the vast majority of approved residential development sites in urban / suburban areas or town centre locations.

Technical noise assessment for the rear elevation of the approved development flats as representative "worse case" potentially subject to noise contributions from activity associated with Ickenham Motor Company's MOT and servicing workshop (day period) using results of the noise survey, 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 $L_{Aeq,16hour}$ 51 - 52dB = Negligible / Low Noise Risk;**
- **Night Period $L_{Aeq,8hour}$ 46 - 48dB = Low 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 any noise protection measures being considered within a development's scheme design, i.e. the noise risk assessment is for a residential development with nil acoustic / noise levels consideration.

The ProPG assessment result of Negligible / Low Noise Risk correlates with the author's subjective observations assessment.

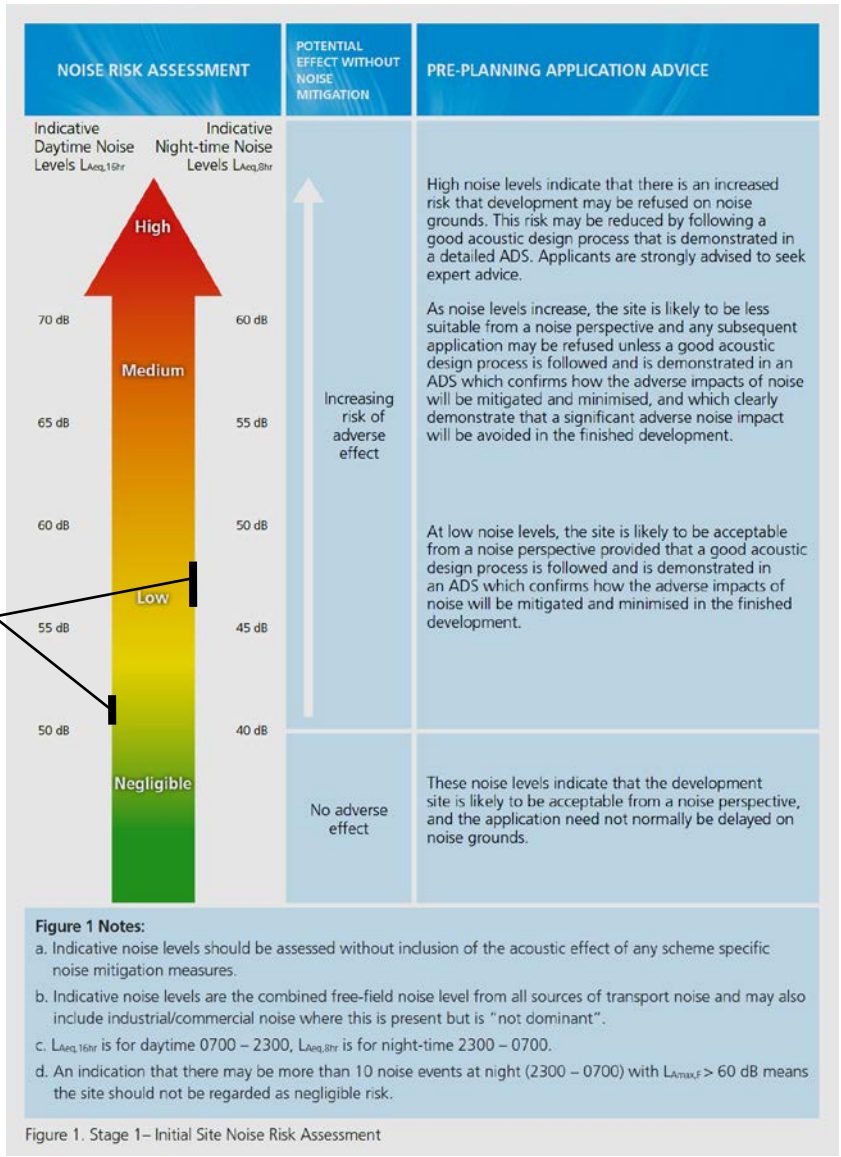


Figure 1. Stage 1– Initial Site Noise Risk Assessment

REAR ELEVATION *(potentially includes noise contribution from ground floor commercial uses at 17-19 Long Lane during day period)*

Day Period $L_{Aeq,16hr}$

51-52dB = Negligible / Low Noise Risk

Night Period $L_{Aeq,8hr}$

46-48dB = Low Noise Risk

The scheme of noise protection measures as detailed in Section 7 of this report and as required by Condition 6 provides an Acoustic Design Statement (ADS) for the development as indicated necessary by the ProPG document Site Noise Risk assessment.

7. SCHEME OF NOISE PROTECTION MEASURES

***Informative (4)*: Scheme Of Noise Protection Measures In Context Of Condition 6**

Condition 6 relates specifically to protection for the approved flats from noise associated with ground floor commercial uses at 17-19 Long Lane.

Noise to the approved development flats front elevation (overlooking Long Lane) does not include contributions from the ground floor commercial uses.

Noise to the approved development flats rear elevation does potentially include some noise associated with the ground floor commercial uses (Ickenham Motor Company's MOT and servicing workshop).

Albeit, as indicated by the survey results / observations, noise to the rear elevation is predominantly due to underlying noise of traffic and does not include significant contributions of noise from the ground floor commercial uses including Ickenham Motor Company's workshop.

Notwithstanding this, the scheme of noise protection measures provided in this section and as required by Condition 6 are established / verified based on noise levels results of the survey as actual / measured, i.e. regardless that values are not representative solely of noise to the approved flats as associated with ground floor commercial uses but are predominantly due to traffic in the local and wider vicinity.

Thus, the scheme of noise protection measures can be considered extremely cautious / robust, as providing mitigation against all noise sources and therefore with certainty of protection for future occupiers for the approved development flats against noise from ground floor commercial uses as required by Condition 6.

A scheme of mitigation measures to protect against noise for residential developments may include consideration of aspects such as building positioning 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 not applicable for the approved flats' development at 17-19 Long Lane and are generally more relevant / practicable for large scale new build residential development schemes / sites with greater land extent and / or that are more detrimentally noise affected.

Thus, and as for most residential developments facilitated by conversion of, and/or extension to, an existing building for this context and urban location setting, the scheme of noise protection measures relates to the acoustic design and specification of noise (sound) insulation performance for elements of the overall building envelope to protect against possible external noise ingress from ground floor commercial uses at 17-19 Long Lane into rooms of the approved flats.

The development building's roof structure / mansard wall elements will by default readily provide more than sufficient sound insulation in terms of protection against external noise.

As for most residential developments, the dominant path for external noise to enter rooms of the approved flats will be via glazing (windows) and any passive type ventilators.

By following the rigorous calculation procedure outlined in Section G.2 of Annex G (informative) of BS8233:2014, a specification for the acoustic (sound insulation) performance of glazing and ventilation provision has been established for the approved flats development.

The specifications are detailed in Sections 7.1 & 7.2 and provide the scheme of noise protection measures required by Condition 6.

Example BS8233:2014 rigorous procedure calculations for noise into main habitable areas for the studio flats are provided in Appendix D.

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 protection measures will ensure noise into the approved flats from rear elevation of the development as during the day period potentially including some noise from the ground floor commercial uses at 17-19 Long Lane (Ickenham Motor Company's MOT & servicing workshop) complies with the indoor ambient noise levels guidance of BS8233:2014.

7.1 Glazing

Table 2 shows the advised specification for glazing acoustic performance.

The glazing acoustic specification relates to the default minimum sound insulation performance for conventional type double glazing of (minimum) 4mm glass / airgap / 4mm glass configuration *(from BS EN 12758: Glass In Building - Glazing & Airborne Sound Insulation)*, with overall performance ≥ Rw 29dB.

Description	Octave Band Centre Frequency (Hz)						Comment
	125	250	500	1k	2k	4k	
Glazing to all rooms / areas of the approved flats	21	17	25	35	37	31	Overall performance ≥ Rw 29dB. Default minimum acoustic performance achieved using conventional thermal double glazing, typically such as minimum 4mm glass / airgap / 4mm glass configuration

Table 2: Advised specification for glazing acoustic performance

7.2 Ventilation Provision

***Informative (5)*: Scope Of Ventilation Provision Within Assessment & Noise Protection Scheme**

Details in this report are with respect to the noise aspect associated with ventilation provision for the approved flats development.

Adequacy of ventilation provision in of itself in respect to compliance with Building Regulations Approved Document F or other guidance (i.e. such as ventilation airflow change rates etc) is outside the scope of a noise assessment / noise protection scheme and would be 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 protection 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 as below.

7.2.1 Overview - Ventilation Provision & Noise Mitigation

New build and/or change of use (conversion) residential dwellings require mandatory ventilation provision compliant with Building Regulations Approved Document F (Ventilation), generally facilitated as per one of the four system methods (System 1 to 4) outlined in Approved Document F.

Full title of the current edition of Approved Document F is *"The Building Regulations 2010 Approved Document F Ventilation – F1 Means of Ventilation (2010 edition incorporating 2010 and 2013 amendments)".*

Typically, a developer is able to decide in outline terms an appropriate ventilation strategy / scheme for 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.

This process may (if required) 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.

7.2.2 AVO Document Guidance

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

As described in sub-section 4.5 of the 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 flats' rear elevation (as potentially subject to some noise associated with ground floor commercial uses) as per the guidance of AVO document Table B-3 is provided in Table 3 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 approved flats as then compliant with the indoor noise levels guidance of BS8233:2014.

Assessment of the development as per guidance of the AVO document in Table 3 shows either of the four system methods outlined in Approved Document F would be appropriate / acceptable for the approved flats in terms of noise protection.

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.

Approved Document F Ventilation System	Ventilation System Outline Description	External Noise Limits (1)	Ventilation System Acceptability For Approved Flats 17-19 Long Lane
1 or 2	System 1: Passive type trickle ventilators & intermittent extract fans (typically to bathroom & kitchen hob) System 2: Passive stack ventilation (no mechanical components specifically as part of the system)	With standard double glazing & standard trickle ventilators: ≤56dB $L_{Aeq,16hour}$ day period ≤51dB $L_{Aeq,8hour}$ night period	**YES**
		With acoustic performance glazing & acoustic trickle ventilators: ≤66dB $L_{Aeq,16hour}$ day period ≤61dB $L_{Aeq,8hour}$ night period	**NOT APPLICABLE** *(approved flats acceptable with standard double glazing & standard trickle ventilators as above)*
3	Passive type trickle ventilators & continuous mechanical extract (MEV)	With standard double glazing & standard trickle ventilators: ≤58dB $L_{Aeq,16hour}$ day period ≤53dB $L_{Aeq,8hour}$ night period	**YES**
		With acoustic performance glazing & acoustic trickle ventilators: ≤68dB $L_{Aeq,16hour}$ day period ≤63dB $L_{Aeq,8hour}$ night period	**NOT APPLICABLE** *(approved flats acceptable with standard double glazing & standard trickle ventilators as above)*
4	Continuous mechanical supply & extract (typically such as MVHR system), no trickle ventilators	System 4 ventilation with standard double glazing: ≤62dB $L_{Aeq,16hour}$ day period ≤57dB $L_{Aeq,8hour}$ night period	**YES**
		System 4 ventilation with acoustic performance glazing: ≤73dB $L_{Aeq,16hour}$ day period ≤68dB $L_{Aeq,8hour}$ night period	**NOT APPLICABLE** *(approved flats acceptable with standard double glazing as above)*
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 3: Assessment to establish ventilation system acceptability (rear elevation approved flats)

7.2.3 Development Ventilation System & Acoustic Specification

Advised ventilation system acoustic specification details for the approved flats are provided in Table 4.

The specification includes each of the Approved Document F ventilation systems as acceptable / applicable for the development established by the assessment in Table 3.

Description	Octave Band Centre Frequency (Hz)						Comments
	125	250	500	1k	2k	4k	
System 1 Approved Document F *(passive trickle ventilators & intermittent extract fans)* **Or** **System 2 Approved Document F** *(passive stack ventilation – with passive trickle ventilators)* **Or** **System 3 Approved Document F** *(passive trickle ventilators & continuous mechanical extract – MEV system)*							
Ventilators to all rooms / areas of the approved flats	30	30	30	30	30	30	Conventional / standard non-acoustic ventilators acceptable, by default have overall performance typically ≥ $D_{n,e}$ 30dB (open position)
System 4 Approved Document F *(continuous mechanical supply & extract - typically such as MVHR system)*							
System 4 ventilation does not include trickle ventilators. System 4 ventilation would be acceptable for the development subject to compliance with the mechanical system specification noise limits detailed in Table 5							

Table 4: Ventilator acoustic specification, Normalised Level Difference $D_{n,e}$ dB

Advised ventilation system associated mechanical component specification noise limits are provided in Table 6 on the following page (only applicable where mechanical ventilation is selected for use by the developer).

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 system's fan and any other associated components) does not cause unacceptable / undesirable noise levels within rooms of dwellings.

Ventilation Condition	Ventilation System	Desirable Internal Ambient Noise Level From Mechanical Services s (1)
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 ≤26dB L_{Aeq} Living Areas ≤30dB 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 ≤26dB L_{Aeq} Living Areas ≤35dB L_{Aeq} Bathrooms / WCs ≤45dB 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*	
Note (1): *For studio type flats, the main habitable room / area of flats is classified as a living area for the day period & a bedroom for the night period*		

Table 5: Ventilation system mechanical component acoustic specification (system self-noise limits)

APPENDIX A

Aerial Image, Site Location Plan & Approved Development Drawings

Site: Approved Flats 17-19 Long Lane, Ickenham UB10 8QU

Report: 24007-002 Appendix A *(page 1 of 3)*

Date: February 2024

AERIAL IMAGE

Site: Approved Flats 17-19 Long Lane, Ickenham UB10 8QU

Report: 24007-002 Appendix A *(page 2 of 3)*

Date: February 2024

SITE LOCATION PLAN & SITE PLAN

Indicates noise survey position; externally to rear elevation first floor level of the building

Ickenham Motor Company MOT & servicing workshop – separate building at ground floor to rear of 17-19 Long Lane (vehicle access to workshop from Edinburgh Drive)

Site: Approved Flats 17-19 Long Lane, Ickenham UB10 8QU

Report: 24007-002 Appendix A *(page 3 of 3)*

Date: February 2024

APPROVED FLATS DEVELOPMENT DRAWINGS

Approved development; 2 x studio flats at second floor (conversion of roof / loft space) above existing first floor flats within the building

Ickenham Motor Company MOT & servicing workshop – separate building at ground floor to rear of 17-19 Long Lane

APPENDIX B

Noise Survey Instrumentation

Site: Approved Flats 17-19 Long Lane, Ickenham UB10 8QU

Report: 24007-002 Appendix B *(page 1 of 2)*

Date: February 2024

NOISE SURVEY INSTRUMENTATION

Seven-Day Noise Survey

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	05/08/2024	TCRT22/1493
Microphone *s/n 313002*	UC-53A			
Preamplifier *s/n 25056*	NH-21			
Calibrator *s/n 2454786*	4231	Bruel & Kjaer	24/01/2025	TCRT23/1062

Instrumentation On-Site Calibration Check:

Description	Calibrator Reference Level	Measured Level	Comment
Before survey measurements	94.0dB	94.1dB	Pass
After survey measurements		94.1dB	Pass *(nil significant drift)*

Site: Approved Flats 17-19 Long Lane, Ickenham UB10 8QU

Report: 24007-002 Appendix B *(page 2 of 2)*

Date: February 2024

NOISE SURVEY INSTRUMENTATION

Octave Band Noise Levels

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 and 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	24/01/2025	TCRT23/1070
Microphone *s/n 2625249*	4189			
Preamplifier *s/n 3268*	ZC0026			
Calibrator *s/n 2454786*	4231	Bruel & Kjaer	24/01/2025	TCRT23/1062

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 significant drift)*

APPENDIX C

Noise Survey Results

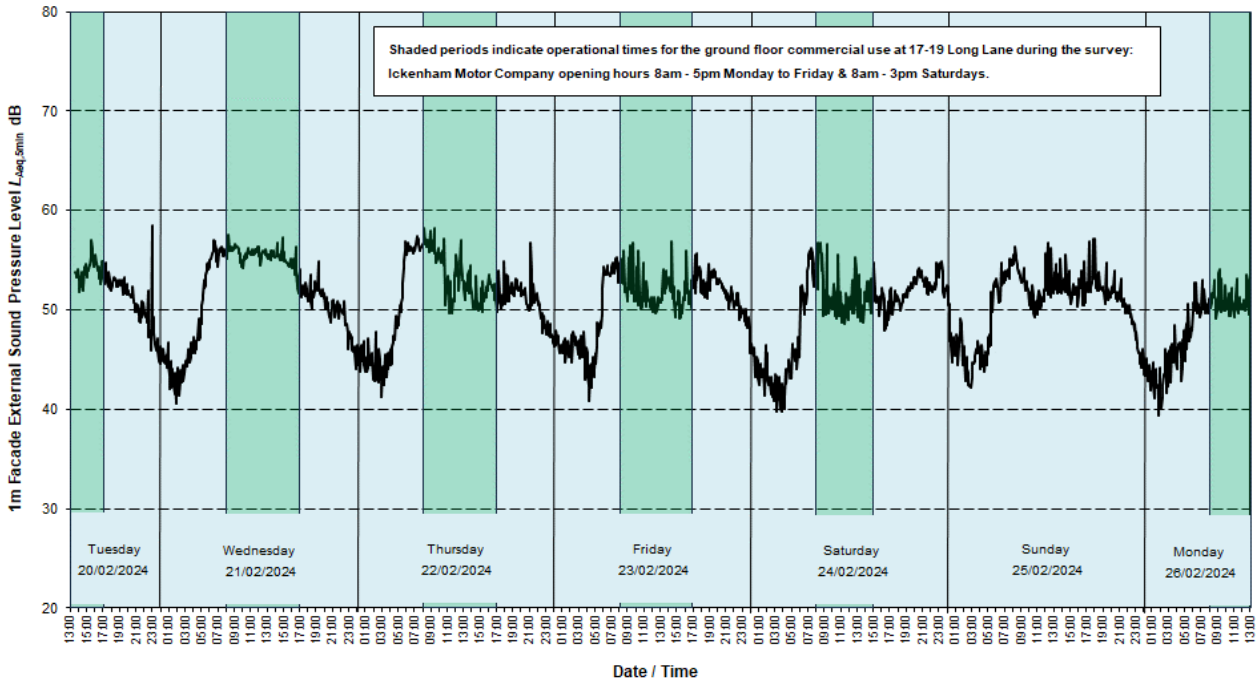
Site: Approved Flats 17-19 Long Lane, Ickenham UB10 8QU

Report: 24007-002 Appendix C *(page 1 of 1)*

Date: February 2024

NOISE SURVEY RESULTS

Seven-Day Noise Survey Raw Data Results: *(rear elevation in direction towards Ickenham Motor Company workshop)*



APPENDIX D

Example BS8233:2014 Annex G Rigorous Procedure Calculations

Site: Approved Flats 17-19 Long Lane, Ickenham UB10 8QU

Report: 24007-002 Appendix D *(page 1 of 2)*

Date: February 2024

BS8233:2014 ANNEX G RIGOROUS PROCEDURE CALCULATIONS

Sample Room: Studio flat main room *(as living area for day period)*

Noise Condition: Rear Elevation Day Period (07:00 to 23:00) Free-Field $L_{Aeq,16hr}$ 52dB

Noise Criterion: Internal Noise Limit In Room $L_{Aeq,16hr}$ ≤35dB

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	52	56	54	50	47	41	36

Building Envelope Details For Sample Room:

Element	Area (m^2) or Vent No	Element Specification / Description
External Walls	0	N/A - studio flat formed within roof structure / loft area of building *(has roof mansard walls)*
Glazing (windows)	3.2	Standard double glazing default acoustic performance ≥ Rw 29dB
Exterior Doors	0	No exterior doors to room
Roof / Mansard Walls	35	Conventional thermal insulated tiled structure + single layer plasterboard linings / ceilings
Ventilation Provision	2	ADF System 1-3 with 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	0						
Glazing (windows)	3.2	21	17	25	35	37	31
Exterior Doors	0						
Roof / Mansard Walls	35	24	34	40	45	49	50
Ventilation (Dn,e)	2	30	30	30	30	30	30
Overall Sound Reduction All Elements Combined		-23.2	-25.9	-30.6	-32.4	-32.6	-32.2

Sample Room Volume (m^3):	50
Sample Room Building Envelope Surface Area (m^2):	38.2

Sample Room Characteristics:

		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Studio Flat (main 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	**29.8**	**40**	**35**	**26**	**20**	**14**	**10**

Site: Approved Flats 17-19 Long Lane, Ickenham UB10 8QU

Report: 24007-002 Appendix D *(page 2 of 2)*

Date: February 2024

BS8233:2014 ANNEX G RIGOROUS PROCEDURE CALCULATIONS

Sample Room: Studio flat main room *(as bedroom for night period – calculation for information only)*

Noise Condition: Rear Elevation Night Period (23:00 to 07:00) Free-Field $L_{Aeq,8hr}$ 48dB

Noise Criterion: Internal Noise Limit In Room $L_{Aeq,16hr}$ ≤30dB

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	48	52	50	46	43	37	32

Building Envelope Details For Sample Room:

Element	Area (m^2) or Vent No	Element Specification / Description
External Walls	0	N/A - studio flat formed within roof structure / loft area of building *(has roof mansard walls)*
Glazing (windows)	3.2	Standard double glazing default acoustic performance ≥ Rw 29dB
Exterior Doors	0	No exterior doors to room
Roof / Mansard Walls	35	Conventional thermal insulated tiled structure + single layer plasterboard linings / ceilings
Ventilation Provision	2	ADF System 1-3 with 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	0						
Glazing (windows)	3.2	21	17	25	35	37	31
Exterior Doors	0						
Roof / Mansard Walls	35	24	34	40	45	49	50
Ventilation (Dn,e)	2	30	30	30	30	30	30
Overall Sound Reduction All Elements Combined		-23.2	-25.9	-30.6	-32.4	-32.6	-32.2

Sample Room Volume (m^3):	50
Sample Room Building Envelope Surface Area (m^2):	38.2

Sample Room Characteristics:

		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Studio Flat (main 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:

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	**25.8**	**36**	**31**	**22**	**16**	**10**	**6**