

Knights Place Farm – Conversion of Stables to Holiday Lets

Noise Assessment

Knights Place Farm Limited

Revision 0

14 July 2022

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1 Introduction

1.1 Appointment

1.1.1 F1 Acoustics Company Limited (F1AC) has been appointed by Knights Place Farm Limited to provide a noise assessment to discharge Condition 4 of Planning Decision 20201237 issued by Gravesham Borough Council for the conversion and alteration of existing stables to four holiday lets with associated car parking.

1.1.2 Condition 4 states:

“Noise Impact Assessment

No development approved by this permission shall be commenced until a noise impact assessment has been carried out submitted to and approved in writing by the Local Planning Authority.

a) The noise impact assessment shall include a scheme setting out how the detailed design and construction of the development, including reference to glazing and ventilation, will ensure compliance with the following requirements:

i) The internal ambient noise levels in all habitable rooms of the holiday lets shall not exceed the guideline LAeq values in Table 4 of BS 8233:2014

ii) The maximum internal noise levels in all habitable rooms should not normally exceed 45dB LAmax more than 10 times per night in accordance with the Professional Practice Guidance on Planning & Noise and the WHO Guidelines for Community Noise.

iii) The rating noise from fixed building services/mechanical plant/equipment associated with the development shall be at least 10dB below the existing LA90 background level at the nearest noise sensitive receptors (i.e. dwellings) when measured and assessed in accordance with BS4142:2014.

b) Where compliance with these criteria will rely on closed windows, the development must include sufficient and suitable ventilation to affected holiday lets by means other than opening windows to ensure that the internal noise levels

required by the above conditions can be retained all year round. The noise assessment should not be limited to noise from traffic and plant, but should also take into account the impact of other existing audible noise sources such as:

- horses neighing/whinnying and*
- behavioural noise from horses kicking and rolling in their stables, and*
- noises associated with the existing licensed premises and*
- vehicles and lorries accessing the container site.*

c) Prior to first occupation of the accommodation, a suitable post-completion report demonstrating compliance with all parts of (a) shall be submitted to and approved, in writing, by the Local Planning Authority. The approved details shall be maintained for the lifetime of the development.”

- 1.1.3 This report sets out the national and local planning policies; national standards and guidance for measuring and assessing sound; the noise surveys, assessments and results; required façade specifications to achieve the criteria; and our conclusions.

1.2 Proposed Development

- 1.2.1 The proposed development of the site comprises the conversion of existing stable buildings to four holiday lets with associated car parking.
- 1.2.2 There are no fixed building services/mechanical plant/equipment associated with the proposed development.

2 Acoustics Terminology

2.1 Introduction to Noise

- 2.1.1 The range of audible sound is from 0 dB to 140 dB. The frequency response of the ear is usually taken to be about 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dB(A) weighting. This is an internationally accepted standard for noise measurements.

2.2 Environmental Acoustics

- 2.2.1 For variable sound sources such as traffic, a difference of 3 dB(A) is just distinguishable. In addition, a doubling of the energy of a sound source would increase the overall sound by 3 dB(A). For example, if one item of machinery results in sound levels of 30 dB(A) at 10 m, then two identical items of machinery adjacent to one another would result in sound levels of 33 dB(A) at 10 m. The 'loudness' of a sound is a purely subjective parameter but it is generally accepted that an increase/decrease of 10 dB(A) corresponds to a doubling/halving in perceived loudness.
- 2.2.2 External sound levels are rarely steady but rise and fall according to activities within an area. In an attempt to produce a figure that relates this variable sound level to subjective response, a number of noise indices have been developed. These include:
- **L_{Amax}**: This is the maximum sound level recorded over the measurement period.
 - **L_{Aeq}**: This is the 'equivalent continuous A-weighted sound pressure level, in decibels' and is defined in British Standard 7445: Description and measurement of environmental noise (BS 7445) [1] as the 'value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time'.

The **L_{Aeq}** is a unit commonly used to describe sound from transport, construction and industrial premises and is the most suitable unit for the description of other forms of

environmental sound. In more straightforward terms, it is a measure of energy within the varying sound levels. It is also the unit best suited to assessing community response.

- **L_{A10}**: This is the sound level that is exceeded for 10% of the measurement period and gives an indication of the louder sound levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.
- **L_{A90}**: This is the sound level that is exceeded for 90% of the measurement period and gives an indication of the sound level during quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial sound.

2.3 Building Acoustics and Sound Insulation

Additional Sound Insulation Related Acoustic Terms:

- **Sound reduction index, R**: Laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.
- **Weighted sound reduction index, R_w**: Single-number quantity which characterises the airborne sound insulating properties of a material or building element over a range of frequencies

NOTE: The weighted sound reduction index is used to characterize the insulation of a material or product that has been measured in a laboratory.

- **D_{n,e,w}**: The Weighted element-normalized level difference defined by BS EN ISO 10140:2010 [2], which characterises the airborne sound insulation performance of a small building element such as a window ventilator.
- **D_{nT,w}**: A single-number quantity which characterises the airborne sound insulation between rooms.
- **C_{tr}**: Correction term applied against the sound insulation single-number values (R_w, D_w, and D_{nT,w}) to provide a weighting against low frequency performance.

NOTE: The reference values used within the C_{tr} calculation are based on urban traffic noise.

3 National and Local Standards, Guidance and Consultation

3.1 Professional Practice Guidance on Planning & Noise: New Residential Development – May 2017

3.1.1 The Professional Practice Guidance on Planning and Noise [3] (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise for new residential development within the planning system in England.

3.1.2 ProPG states:

“... noise is a material consideration in the planning process and a key aspect of sustainable development. Noise must therefore be given serious attention when new developments might create additional noise and when new developments would be sensitive to prevailing acoustic conditions.”

3.1.3 ProPG acknowledges and reflects the Government’s overarching Noise Policy Statement for England [4] (NPSE), the National Planning Policy Framework [5] (NPPF) and Planning Practice Guidance (including PPG-Noise [6]), as well as other authoritative sources of guidance including WHO Guidelines for Community Noise [7] and British Standard BS 8233:2014 Guidance on sound insulation and noise reduction for buildings [8].

3.1.4 The guidance sets out a two-staged approach, Stage 1 is an initial noise risk assessment of the proposed development site; while Stage 2 is the systematic consideration of the following four key elements:

- Element 1 – demonstrating a “Good Acoustic Design Process”
- Element 2 – observing internal “Noise Level Guidelines”
- Element 3 – undertaking an “External Amenity Area Noise Assessment”
- Element 4 – consideration of “Other Relevant Issues”

3.1.5 ProPG does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate.

3.2 British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings

3.2.1 BS 8233 provides guidance for the control of noise in and around buildings. It is applicable to the design of new buildings, or refurbished buildings undergoing a change of use.

3.2.2 Guidance is given on acoustic criteria and noise levels appropriate for various types of space that have different functions. Table 3.1 provides the BS 8233 guideline values for internal ambient noise levels for dwellings which are based on the guidelines issued by the World Health Organisation (WHO) in the Guidelines for Community Noise document and assume normal diurnal fluctuations in external noise. In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values.

Table 3.1: BS 8233 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB L _{Aeq} , 16hour	-
Dining	Dining room/area	40 dB L _{Aeq} , 16hour	-
Sleeping (daytime resting)	Bedroom	35 dB L _{Aeq} , 16hour	30 dB L _{Aeq} , 8hour

3.2.3 The guideline levels are based on annual average data and do not have to be achieved in all circumstances.

3.2.4 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

3.2.5 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

3.2.6 With regard to individual event maximum noise levels BS 8233 states:

“Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL

or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values.”

The WHO Guidelines for Community Noise give a specific maximum noise level, L_{Amax} 45 dB that should not normally be exceeded more than 10 - 15 times per night, which will be adopted in this assessment.

- 3.2.7 BS 8233 Annex G provides guidance on calculating the sound insulation performance for the façade or external envelope of a building.

3.3 World Health Organisation – Environmental Noise Guidelines for the European Region

- 3.3.1 Environmental noise is an important public health issue, featuring among the top environmental risks to health. It has negative impacts on human health and well-being and is a growing concern among both the general public and policy-makers in Europe.
- 3.3.2 The WHO Regional Office for Europe has developed environmental noise guidelines for the European Region [9], proposing an updated set of public health recommendations on exposure to environmental noise.
- 3.3.3 The main purpose of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise. The guidelines focus on the WHO European Region and provide policy guidance to Member States that is compatible with the noise indicators used in the European Union Directive 2002/49/EC relating to the assessment and management of environmental noise.
- 3.3.4 The guidelines set out to define recommended exposure levels for environmental noise in order to protect population health.
- 3.3.5 The current environmental noise guidelines for the European Region supersede the WHO guidelines for community noise (CNG) from 1999. Nevertheless, the Guideline Development Group recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid.

3.4 World Health Organisation - Guidelines for Community Noise

- 3.4.1 The following guideline values in Table 3.2 for community ambient noise levels in specific environments are presented in the WHO Guidelines for Community Noise.

Table 3.2: WHO Guidelines for Community Noise in Specific Environments

Specific Environment	Critical Health Effect(s)	$L_{Aeq,T}$, dB	Period (T)	$L_{Amax, Fast}$, dB
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outdoor amenity/living areas	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-

- 3.4.2 The $L_{Amax,F}$ 45 dB criterion for bedrooms at night, includes the guidance:

“For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10 - 15 times per night.”

- 3.4.3 The $L_{Amax,F}$ 45 dB criterion applies to “single sound events” within bedrooms at night. This guideline is generally interpreted as the value that individual noise events should not normally exceed. We have interpreted this as no more than two events per hour, which therefore equates to up to 16 events over an 8-hour night-time period.

3.5 National Planning Policy Framework

- 3.5.1 The National Planning Policy Framework (NPPF) came into place on 27th March 2012, updated in July 2018, February 2019 and the latest update was July 2021. The NPPF sets out the Governments planning policies for England and how these are expected to be applied.
- 3.5.2 The framework provides guidance to local planning authorities to create their own policies relating to the needs of their own jurisdiction. Paragraphs 170 e), 180 a) and 182 relate to noise and state the following:

“15. Conserving and enhancing the natural environment

174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

...

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

...

Ground conditions and pollution

...

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

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life⁶⁵;

[⁶⁵ See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).]

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

...

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as

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

3.6 Acoustics, Ventilation and Overheating – Residential Design Guide

- 3.6.1 The Acoustics, Ventilation and Overheating Guide [10] ('AVO Guide'), published in January 2020, is intended to be used by acoustics practitioners as well as all those involved in the planning, development, design and commissioning of new dwellings. It recommends an approach to acoustic assessments for new residential development that take due regard of the interdependence of provisions for acoustics, ventilation, and overheating. Application of the AVO Guide is intended to demonstrate good acoustic design as described in the ProPG, when considering internal noise level guidelines.
- 3.6.2 The AVO Guide aims to assist designers to adopt an integrated approach to the acoustic design within the context of the ventilation and thermal comfort requirements.
- 3.6.3 The AVO Guide includes:
- an explanation of ventilation requirements under The Building Regulations as described in 'Approved Document F – Means of Ventilation, 2010 Edition' [11] ('ADF') along with typical ventilation strategies and associated noise considerations;
 - an explanation of the overheating assessment methodology described in CIBSE 'Design methodology for the assessment of overheating risk in homes' [12] ('TM59');
 - potential acoustic scale and guidance relating to different ventilation and overheating conditions, for both environmental noise ingress and building services noise; and

- a worked example of the application of the AVO Guide including indicative design constraints for different ventilation and overheating mitigation strategies.

3.7 Consultation with Gravesham Borough Council

- 3.7.1 Consultation was carried out with Keith Moorhouse - Senior Environmental Health Technician at Gravesham Borough Council to agree the scope of assessment and the duration of the noise surveys to be undertaken.

4 Site Description and Proposed Application

4.1 Existing Site Description

- 4.1.1 The existing site is a courtyard of former stables, with an east and west wing and a small central barn, located at Knights Place Farm, Cobham, ME2 3UB.
- 4.1.2 To the east of the site is the Knights Place Farm Equestrian Centre with associated buildings including stables which adjoin the east wing of buildings within the courtyard. Further to the east is an area of land currently in use as a storage area. To the west and south are residential properties.
- 4.1.3 Approximately 200 m north of the site is the High Speed 1 railway and approximately 550 m to the north the M2 motorway.
- 4.1.4 A site location plan is provided in Figures 1 and 2.

4.2 Proposed Development Detailed Description

- 4.2.1 The proposed development of the site comprises the conversion of the central barn and east wing stable buildings to four holiday lets with associated car parking. The east wing building shares a party wall with the adjacent stables of the Equestrian Centre. The west wing building is not part of the application and is used as domestic storage by Knights Place Farm.
- 4.2.2 There are no fixed building services/mechanical plant/equipment associated with the proposed development.
- 4.2.3 Floor plans and elevations of the proposed development are shown in Figures 3 to 6.

5 Baseline Noise Survey

5.1 Noise Survey Information

Noise Survey 1

- 5.1.1 An external unattended baseline noise survey was undertaken at a location representative of the north façade of the proposed development. The survey was located on an area of grass immediately to the north of the west wing of stable buildings.
- 5.1.2 The survey was mounted on a pole attached to a fence. The microphone of the sound level meter was at a height of 1.5 m above ground level and in a free-field location.
- 5.1.3 The survey was carried out between 15:00 on Thursday 21st April and 13:45 on Friday 29th April 2022. Due to a period of noisy works being undertaken at the Farm between 07:00 on Saturday 23rd and 23:00 on Monday 25th April the data from this period has been excluded from the survey results as it was not representative and has not been used in the assessment. A further survey was undertaken between 15:00 on Friday 20th May and 12:00 on Wednesday 25th May 2022 to ensure adequate noise data was measured over a weekend period.
- 5.1.4 The noise environment at the survey location on set-up and collection was comprised of distant road traffic from the M2 motorway, occasional trains on the railway, occasional vehicles moving within the farm, horses in the surrounding fields, wind in the trees and birdsong. The survey location is shown in Figure 2.

Noise Survey 2

- 5.1.5 An external unattended baseline noise survey was undertaken at the east façade of the proposed development, overlooking the stable yard of the adjacent Equestrian Centre.
- 5.1.6 The survey was mounted on the east façade of the proposed development. The microphone of the sound level meter was at a height of 2.3 m above ground level and in a façade location.
- 5.1.7 The survey was carried out between 15:00 on Thursday 21st April and 13:45 on Friday 29th April 2022. Due to a period of noisy works being undertaken at the Farm between 07:00 on Saturday 23rd and 23:00 on Monday 25th April the data from this

period has been excluded from the survey results as it was not representative and has not been used in the assessment. A further survey was undertaken between 15:00 on Friday 20th May and 12:00 on Wednesday 25th May 2022 to ensure adequate noise data was measured over a weekend period.

- 5.1.8 The noise environment at the survey location on set-up and collection was comprised of activity associated with the Equestrian Centre and stables including horses, people talking, sweeping and cleaning out stables. The survey location is shown in Figure 2.

Noise Survey 3

- 5.1.9 An internal attended noise survey was undertaken within the east wing of the existing building in the area that adjoins the stables at the Equestrian Centre in order to measure noise from horse activity in the adjoining stables.
- 5.1.10 The survey was mounted on a tripod. The microphone of the sound level meter was at a height of 1.5 m above ground level and in the centre of the space adjacent to the party wall, 2.4 m from the walls.
- 5.1.11 The survey was carried out between 10:50 and 12:00 on Monday 25th April.
- 5.1.12 The noise environment during the survey included noise from horse activity in the adjacent stables as well as a number of other noise sources including birds flying in and out of the building, banging from sections of the roof being blown by the wind and vehicle movements outside. Detailed observation notes were made throughout the survey in order to identify noise from the horse activity. The survey location is shown in Figure 2.

Equipment and Calibration

- 5.1.13 The instrumentation used were Rion NL-52 sound level meters (SLM) (F1AC-001, F1AC-002 and F1AC-066) and Rion NC-74 sound level calibrator (F1AC-004).
- 5.1.14 For the unattended surveys, the SLM were configured to log 15-minute octave band measurements of the L_{Aeq} , L_{A90} , L_{A10} , and L_{Amax} . For the attended survey, the SLM was configured to log 10-second octave band measurements of the L_{Aeq} , L_{A90} , L_{A10} , and L_{Amax} .

- 5.1.15 The SLM had field calibration checks carried out prior to and immediately following the measurements and no significant deviation was recorded. All instrumentation used has been calibrated to traceable standards within two years.

Weather

- 5.1.16 Meteorological conditions were monitored throughout the survey durations and were suitable for environmental baseline noise monitoring, following the guidance contained within BS 4142 [13].

5.2 Unattended External Baseline Noise Survey Results

- 5.2.1 A summary of the measured broadband noise levels during the unattended surveys 1 and 2, to the north and east of the proposed development, are presented in Tables 5.1 and 5.2, respectively. Detailed survey results are provided in Appendix A. The results of the internal attended noise survey is discussed in Section 6.3.

Table 5.1: Noise Survey 1 Results Summary

Date	Period (T)	$L_{Aeq,T}$, dB	Range of $L_{Amax,15min}$, dB	$L_{A10,T}$, dB	$L_{A90,T}$, dB
Thursday 21/04/2022	15:00 - 23:00	58	64 – 77	60	56
	23:00 - 07:00	55	57 - 85	56	51
Friday 22/04/2022	07:00 - 23:00	59	62 - 79	61	57
	23:00 - 07:00	54	56 – 83	55	49
Saturday 23/04/2022	07:00 - 23:00	Data excluded due to noisy works taking place at the farm.			
	23:00 - 07:00				
Sunday 24/04/2022	07:00 - 23:00				
	23:00 - 07:00				
Monday 25/04/2022	07:00 - 23:00				
	23:00 - 07:00	57	58 - 80	57	52
Tuesday 26/04/2022	07:00 - 23:00	58	59 – 90	57	53
	23:00 - 07:00	55	58 - 78	56	51
Wednesday 24/04/2022	07:00 - 23:00	59	61 - 87	60	56
	23:00 - 07:00	56	58 - 80	57	51
Thursday 28/04/2022	07:00 - 23:00	58	60 - 78	59	55
	23:00 - 07:00	55	58 - 73	56	50
Friday 29/04/2022	07:00 – 13:45	59	64 - 81	61	57
Friday 20/05/2022	07:00 - 23:00	53	56 - 74	55	50
	23:00 - 07:00	51	53 – 71	52	48
Saturday 21/05/2022	07:00 - 23:00	53	53 – 80	54	48
	23:00 - 07:00	53	57 – 73	54	49
Sunday	07:00 - 23:00	48	51 – 77	50	42

Date	Period (T)	$L_{Aeq,T}$, dB	Range of $L_{Amax,15min}$, dB	$L_{A10,T}$, dB	$L_{A90,T}$, dB
22/05/2022	23:00 - 07:00	51	50 – 71	50	45
Monday	07:00 - 23:00	54	59 – 91	55	48
23/05/2022	23:00 - 07:00	53	53 – 74	52	48
Tuesday	07:00 - 23:00	55	53 – 90	55	49
24/05/2022	23:00 - 07:00	52	51 – 70	52	48
Wednesday	07:00 - 12:00	54	60 - 75	56	51
25/05/2022					

5.2.2 The average measured free-field noise levels at survey location 1 are $L_{Aeq,16hrs}$ 57 dB during the daytime and $L_{Aeq,8hrs}$ 54 dB during the night-time. The L_{Amax} that will not be exceeded on average more than 10 times per night has been determined as 64 dB, based on the noise survey data as presented in Appendix A. The noise levels measured at survey location 1 are considered representative of the northern and western façades of the proposed development.

Table 5.2: Noise Survey 2 Results Summary

Date	Period (T)	$L_{Aeq,T}$, dB	Range of $L_{Amax,15min}$, dB	$L_{A10,T}$, dB	$L_{A90,T}$, dB
Thursday	15:00 - 23:00	54	57 - 93	53	49
21/04/2022	23:00 - 07:00	48	50 - 80	46	42
Friday	07:00 - 23:00	56	55 - 91	54	50
22/04/2022	23:00 - 07:00	46	55 - 71	46	42
Saturday	07:00 - 23:00	Data excluded due to noisy works taking place at the farm.			
23/04/2022	23:00 - 07:00				
Sunday	07:00 - 23:00				
24/04/2022	23:00 - 07:00				
Monday	07:00 - 23:00	Data excluded due to noisy works taking place at the farm.			
25/04/2022	23:00 - 07:00	48	53 - 73	48	44
Tuesday	07:00 - 23:00	51	52 - 85	50	45
26/04/2022	23:00 - 07:00	45	49 - 75	45	42
Wednesday	07:00 - 23:00	53	55 - 88	52	48
24/04/2022	23:00 - 07:00	48	51 - 77	48	44
Thursday	07:00 - 23:00	56	54 - 93	52	47
28/04/2022	23:00 - 07:00	46	50 - 75	46	43
Friday	07:00 – 13:45	53	55 - 86	53	47
29/04/2022					
Friday	07:00 - 23:00	50	52 - 82	48	41
20/05/2022	23:00 - 07:00	45	51 - 73	45	39
Saturday	07:00 - 23:00	53	50 - 87	50	39
21/05/2022	23:00 - 07:00	46	46 - 67	46	39

Date	Period (T)	$L_{Aeq,T}$, dB	Range of $L_{Amax,15min}$, dB	$L_{A10,T}$, dB	$L_{A90,T}$, dB
Sunday 22/05/2022	07:00 - 23:00	52	54 - 89	47	38
	23:00 - 07:00	48	49 - 79	46	38
Monday 23/05/2022	07:00 - 23:00	54	53 - 92	50	42
	23:00 - 07:00	46	44 - 79	45	39
Tuesday 24/05/2022	07:00 - 23:00	58	51 - 90	52	42
	23:00 - 07:00	45	48 - 71	44	40
Wednesday 25/05/2022	07:00 - 12:00	52	69 - 83	50	43

5.2.3 The average measured façade noise levels at survey location 2 are $L_{Aeq,16hrs}$ 54 dB during the daytime and $L_{Aeq,8hrs}$ 47 dB during the night-time. The L_{Amax} that will not be exceeded on average more than 10 times per night has been determined as 65 dB, based on the noise survey data as presented in Appendix A. The noise levels measured at survey location 2 are considered representative of the eastern and southern façades of the proposed development.

6 Noise Assessments and Results

6.1 BS 8233 Noise Assessment

6.1.1 A BS 8233 assessment has been carried out to assess the suitability of the internal noise levels of the habitable rooms within the proposed holiday lets. Habitable rooms include bedrooms, living rooms and dining rooms.

6.1.2 The room dimension information used within the assessment is provided in Appendix B.

Internal Noise Level Criteria

6.1.3 The following guideline values as stated in BS 8233 have been adopted as the internal noise level criteria, as recommended in ProPG:

- Living rooms and bedrooms during the day (07:00 to 23:00) $L_{Aeq,16hrs}$ 35 dB;
- Dining rooms during the day (07:00 to 23:00) $L_{Aeq,16hrs}$ 40 dB; and
- Bedrooms at night (23:00 to 07:00) $L_{Aeq,8hrs}$ 30 dB and $L_{Amax,F}$ 45 dB.

6.1.4 The maximum noise level criteria has been assessed following the guidance from the WHO Guidelines for Community Noise and recommendations in ProPG that internal maximum noise levels should not normally exceed $L_{Amax,F}$ 45 dB more than 10 to 15 times per night in bedrooms.

External Noise Levels

6.1.5 The representative free-field noise levels measured at the survey location 1 and representative of the northern and western façades of the development are $L_{Aeq,16hrs}$ 57 dB during the daytime; $L_{Aeq,8hrs}$ 54 dB during the night-time; and the $L_{Amax,F}$ that will not be exceeded more than 10 – 15 times per night is 64 dB.

6.1.6 The representative façade noise levels measured at the survey location 2 and representative of the eastern and southern façades of the development are $L_{Aeq,16hrs}$ 54 dB during the daytime; $L_{Aeq,8hrs}$ 47 dB during the night-time; and the $L_{Amax,F}$ that will not be exceeded more than 10 – 15 times per night is 65 dB.

Façade Elements

6.1.7 The assessment has been carried out based on the following external wall constructions as provided by the project architect. Drawings of the wall constructions and the locations of each wall type are shown in Figure 7. The sound insulation performance for each construction have been predicted using the sound reduction modelling software Insul.

- EW01 – Masonry: Existing Masonry Wall (assumed to be single brick) / independent timber stud wall / 100 mm thermal insulation / 12.5 mm wallboard. Sound reduction index R_w+C_{tr} 46 dB.
- EW02 – Timber Frame Cladding: Pine Weatherboard / 18 mm plywood sheathing / 100 mm thermal insulation / existing timber studs / 12.5 mm wallboard. Sound reduction index R_w+C_{tr} 29 dB.
- RT01 – Roof: tiled roof / 160 mm thermal insulation / timber rafters / 12.5 mm wallboard. Sound reduction index R_w+C_{tr} 35 dB.

External to Internal Noise Assessment - Open Windows Simple Assessment

6.1.8 The internal noise levels with open windows to habitable rooms has been assessed based on the measured external noise levels and assuming a 13 dB sound reduction from outside to inside with windows partially open to provide a ventilation free-area equivalent to 2% of the floor area. The open window internal noise level assessment is provided in Appendix C.

6.1.9 Appendix C demonstrates that with open windows all of the habitable rooms will not achieve the criteria for internal noise levels during the daytime and night-time. Therefore, a more detailed external to internal noise level assessment will be required to take into consideration the individual façade element sound reduction including suitable ventilation so that windows can be kept closed to achieve a reasonable internal noise level.

Ventilation Strategy

6.1.10 The proposed development will be required to achieve the ventilation requirements of ADF. As the required internal noise levels are not achieved with windows open ADF

‘System 1: Background ventilators and intermittent extract fans’ and ‘System 2: Passive stack (“natural”)’ are not viable.

6.1.11 An appropriate ventilation system maybe ADF ‘System 3: Continuous mechanical extract (MEV)’ or ‘System 4: Continuous mechanical supply and extract with heat recovery (MVHR)’. Trickle ventilators would be required for System 3 but not for System 4. This information is not intended to constitute a ventilation strategy, if required a ventilation strategy will be provided by an appropriately qualified person.

6.1.12 The design of the ventilation system should also consider the internal ambient noise levels from mechanical services. Recommendations for desirable internal ambient noise levels for ADF ventilation conditions are set out in Table 3-4 of the AVO Guide, reproduced below in Table 6.1.

Table 6.1: AVO Guide Indoor ambient noise levels from mechanical services

Ventilation condition	Possible system or design solution	Desirable internal ambient noise levels from mechanical services
ADF – Whole Dwelling Ventilation	System 3: Continuous mechanical extract (MEV), minimum low ventilation rates System 4: Continuous mechanical supply and extract with heat recovery (MVHR), minimum low ventilation rates	Bedrooms $\leq L_{Aeq}$ 26 or 30 dB ¹ Living Rooms $\leq L_{Aeq}$ 30 dB
ADF – Extract Ventilation	System 1: Intermittent extract fans System 3: Continuous mechanical extract (MEV), minimum high ventilation rates System 4: Continuous mechanical supply and extract with heat recovery (MVHR), minimum high ventilation rates	Bedrooms $\leq L_{Aeq}$ 26 or 30 dB Living / Dining Rooms $\leq L_{Aeq}$ 35 dB Bathroom / WC / Kitchen $\leq L_{Aeq}$ 45 dB
ADF – Purge Ventilation	Manually controlled fan exchanging a minimum 4 air changes per hour	No desirable noise levels are currently proposed based on the lack of evidence of acceptable noise levels when providing purge ventilation for the purpose of rapidly diluting indoor pollutants.

¹ A lower level may be more appropriate; refer to AVO Guide paragraph 3.31.

External to Internal Noise Assessment - Closed Windows Detailed Assessment

6.1.13 The calculation methodology as given in BS 8233:2014 G.2 ‘Typical design problem: more rigorous calculation’ has been followed. The detailed external to internal noise

level calculations for the ambient and maximum noise levels for habitable rooms are provided in Appendix D and a summary is provided in Appendix E.

- 6.1.14 Due to variation in the size and shape of the habitable rooms and the varying ratios of glazing to façade throughout the proposed development, detailed external to internal noise level calculations have been carried for each habitable room.
- 6.1.15 Table 6.2 below details the window and ventilation sound reduction specifications required for each habitable room of the proposed development to achieve the internal noise level criteria. Table 6.3 provides example glazing descriptions that may achieve the required specifications.

Table 6.2: Glazing and Ventilation Sound Reduction Specifications

Unit	Room	Façade	Glazing Attenuation		Ventilation Attenuation ¹
			R_w	$R_w + C_{tr}$	$D_{n,e,w} + C_{tr}$
1	Living/Dining	N	29	25	27
1		S	29	25	27
1		W	29	25	27
1	Bedroom 1	E	29	25	27
1	Bedroom 2	W	29	25	27
2	Living/Kitchen/Bedroom	N	29	25	27
3	Living/Kitchen/Dining	W	29	25	27
3	Bedroom 1	W	29	25	27
4	Living/Kitchen/Dining	E	29	25	27
4		W	29	25	27
4	Bedroom 1	W	29	25	27

¹ Attenuation values for ventilation products located on the façade of habitable rooms, if required, dependant on the chosen ventilation system.

Table 6.3: Example Glazing Descriptions

Glazing Attenuation		Example Glazing Description ¹
R_w	$R_w + C_{tr}$	
29	25	4-(6-16)-4 mm

¹ The descriptions provide information on types of product that may achieve the required specification. To achieve the required internal levels the windows and ventilation products used must achieve the attenuation values in Table 6.2.

- 6.1.16 If more than one ventilator is fitted on a façade the required $D_{n,e,w} + C_{tr}$ sound reduction specification of each ventilator should be increased by a factor of $10 \log N$, where N is the number of ventilators. For example, if two ventilators are required in a room the sound reduction specification of each ventilator should be increased by 3 dB, to achieve the overall $D_{n,e,w} + C_{tr}$ as presented in Table 6.2.

- 6.1.17 As the habitable rooms will not be able to have open windows and meet the required internal noise level criteria, windows will need to be kept closed and an alternative method of ventilation provided as discussed in the Ventilation Strategy section above. Opening windows may still be acceptable to provide purge ventilation. Purge ventilation is defined in ADF as “manually controlled ventilation of rooms or spaces at a relatively high rate to rapidly dilute pollutants and/or water vapour.”
- 6.1.18 Guidance on overheating is not included within ADF and has usually been controlled through the opening of windows. The design for the building and ventilation strategy should consider the control of overheating in order to minimise the requirement for opening windows.

6.2 BS 8233 Assessment Results

- 6.2.1 The detailed external to internal ambient noise calculation in Appendix D and the summary in Appendix E show that the internal ambient noise levels over the daytime and night-time are within the internal noise level criteria, with the window and ventilation sound reduction specifications as detailed in Table 6.2. The daytime internal noise levels in the habitable rooms range from $L_{Aeq,16hrs}$ 26 to 31 dB. The internal noise levels during the night-time in the bedrooms range from $L_{Aeq,8hrs}$ 20 to 29 dB.
- 6.2.2 The detailed external to internal ambient noise calculation in Appendix D and the summary in Appendix E show that the internal maximum noise levels in bedrooms during the night-time are not likely to exceed L_{Amax} 45 dB more than 10 to 15 times per night, which is within the WHO criteria and ProPG recommendations adopted for this assessment. The calculated internal maximum noise levels that will not be exceeded more than 10 – 15 times per night in the bedrooms range from $L_{Amax,F}$ 32 to 40 dB.

Mitigation Measures

- 6.2.3 No additional mitigation measures are required to achieve the internal noise level criteria if the building façade element specifications as given in Paragraph 6.1.7 and Table 6.2 are achieved.

6.3 Horse Activity Noise Assessment

6.3.1 Due to the proposed development sharing a party wall with the adjacent stables of the Equestrian Centre an assessment of the noise from horse activity in the stable has been carried out. The habitable room that shares the party wall with the stable is a bedroom.

6.3.2 Observations from within the existing building that shares the party wall with the stable identified that only occasional noise from horse activity was audible. Therefore, the noise assessment of horse activity in the adjacent stables will be based on the $L_{Amax,F}$ maximum noise levels from the horse activity.

Horse Activity $L_{Amax,F}$ Noise Level Criteria

6.3.3 The maximum noise level criteria for the horse activity has been assessed following the guidance from the WHO Guidelines for Community Noise and recommendations in ProPG that internal maximum noise levels should not normally exceed $L_{Amax,F}$ 45 dB more than 10 to 15 times per night in bedrooms.

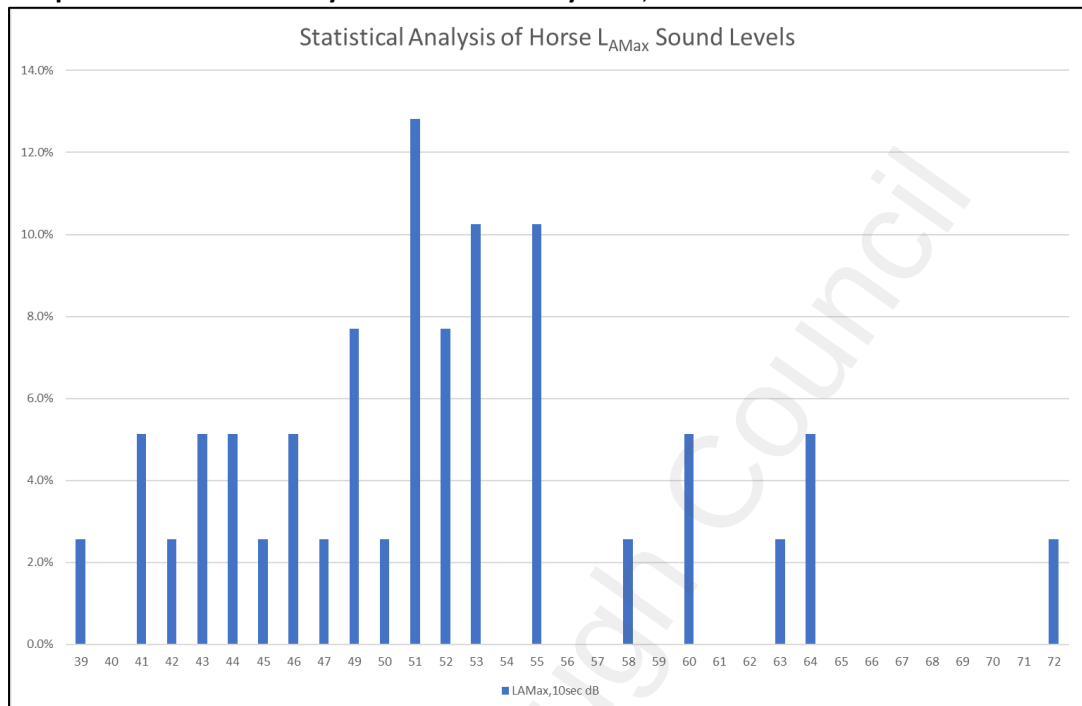
Measured Horse Activity $L_{Amax,F}$ Noise Levels

6.3.4 An attended noise survey was carried out within the existing building in the area that will become the bedroom sharing the party wall with the stable. Detailed observations were made throughout the survey to identify maximum noise events as a result of horse activity in the adjacent stable.

6.3.5 The survey was carried out in the daytime over a period of 70 minutes, during which 39 maximum noise events as a result of horse activity in the adjacent stable were identified.

6.3.6 Graph 6.1 shows the maximum noise level ($L_{Amax,F,10sec}$) distribution for the observed maximum noise events as a result of horse activity for the calculation of a representative $L_{Amax,F}$ noise level to be used in the noise assessment.

Graph 6.1: Statistical Analysis of Horse Activity $L_{Amax,F}$ Sound Levels



- 6.3.7 Based on the distribution data shown in Graphs 6.1 the representative $L_{Amax,F}$ sound level that will be used in the assessment will be $L_{Amax,F,10\text{ sec}}$ 60 dB. Based on the measured data and the likelihood that horse activity would be less frequent during the night-time period it is considered that the level of $L_{Amax,F,10\text{ sec}}$ 60 dB would not normally be exceeded 10 to 15 times per night.

Noise Assessment

- 6.3.8 To achieve the internal noise criteria the sound insulation of the party wall between the Equestrian Centre stable and the proposed bedroom will require improvement.
- 6.3.9 The existing separating wall is constructed from four courses of concrete blocks with two layers of plywood above.
- 6.3.10 The proposed wall construction for the party wall is an aerated concrete block wall (140 mm) / independent timber stud wall / 100 mm thermal insulation / 12.5 mm wallboard.
- 6.3.11 The sound insulation performance for the existing and proposed wall constructions have been predicted using the sound reduction modelling software Insul. The calculated sound reduction index for the existing wall is R_w+C_{tr} 22 dB and the calculated sound reduction index for the proposed wall is R_w+C_{tr} 39 dB.

- 6.3.12 The improvement in the sound reduction performance afforded by the proposed wall construction when applied to the horse activity $L_{Amax,F}$ noise level of 60 dB results in a predicted internal $L_{Amax,F}$ noise level from horse activity of 45 dB, therefore achieving the horse activity $L_{Amax,F}$ noise level criteria. Full noise survey and sound insulation calculation details are provided in Appendix F.

Mitigation Measures

- 6.3.13 No additional mitigation measures are required to achieve the internal $L_{Amax,F}$ noise level criteria if the building façade element specifications as given in Paragraph 6.3.10 are achieved.

7 Summary and Conclusions

- 7.1.1 F1 Acoustics Company Limited (F1AC) has been appointed by Knights Place Farm Limited to provide a noise assessment to discharge Condition 4 of Planning Decision 20201237 issued by Gravesham Borough Council for the conversion and alteration of existing stables to four holiday lets with associated car parking.
- 7.1.2 This report sets out the national and local planning policies; national standards and guidance for measuring and assessing sound; the noise surveys, assessments and results; required façade specifications to achieve the criteria; and our conclusions.
- 7.1.3 The existing site is a courtyard of former stables, with an east and west wing and a small central barn, located at Knights Place Farm, Cobham, ME2 3UB.
- 7.1.4 To the east of the site is the Knights Place Farm Equestrian Centre with associated buildings including stables which adjoin the east wing of buildings within the courtyard. Further to the east is an area of land currently in use as a storage area. To the west and south are residential properties.
- 7.1.5 Approximately 200 m north of the site is the High Speed 1 railway and approximately 550 m to the north the M2 motorway.
- 7.1.6 The proposed development of the site comprises the conversion of central barn and east wing stable buildings to four holiday lets with associated car parking.
- 7.1.7 There are no fixed building services/mechanical plant/equipment associated with the proposed development.
- 7.1.8 Unattended baseline noise monitoring has been undertaken at two locations to determine the existing noise environment.
- 7.1.9 A BS 8233 assessment has been carried out to assess the internal noise levels within the proposed development.
- 7.1.10 The detailed external to internal ambient noise calculation in Appendix D and the summary in Appendix E show that the internal ambient noise levels over the daytime and night-time and the night-time maximum sound levels are within the adopted internal sound level criteria.

- 7.1.11 A suitable ventilation strategy will be required for the proposed development because openable windows cannot be relied upon for the necessary ventilation without exceeding the internal noise level criterion.
- 7.1.12 No additional mitigation measures are required to achieve the internal noise level criteria if the building façade element specifications as given in Table 6.2 are achieved.
- 7.1.13 Based on the BS 8233 internal habitable room noise level assessment with the building façade element specifications as given in Table 6.2 the requirements of Condition 4 of Planning Decision 20201237 would be achieved.
- 7.1.14 An attended noise survey was undertaken within the east wing of the existing building in the area that adjoins the stables at the Equestrian Centre in order to measure noise from horse activity in the adjoining stables.
- 7.1.15 An assessment of the horse activity in the adjacent stables has been carried out to assess the internal noise levels within the proposed development.
- 7.1.16 The horse activity noise assessment in Appendix F shows that the internal maximum sound levels from horse activity are within the adopted internal sound level criteria.
- 7.1.17 No additional mitigation measures are required to achieve the internal noise level criteria if the building element specifications as given in Paragraph 6.3.10 are achieved.
- 7.1.18 Based on the horse activity room assessment with the building element specifications as given in Paragraph 6.3.10 the requirements of Condition 4 of Planning Decision 20201237 would be achieved.

References

1. British Standards Institution. British Standard 7445: Description and measurement of environmental noise. Part 1: Guide to environmental quantities and procedures. 2003.
2. British Standards Institution. BS EN ISO 10140 Acoustics. Laboratory measurement of sound insulation of building elements. 2010
3. ProPG: Planning & Noise - Professional Practice Guidance on Planning & Noise: New Residential Development. May 2017
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6. Ministry of Housing, Communities & Local Government. Planning Practice Guidance – Noise. March 2014
7. Guidelines for Community Noise. World Health Organisation. 2000.
8. British Standards Institution. British Standard 8233: Sound insulation and noise reduction for buildings - Code of practice. 2014.
9. Environmental Noise Guidelines for the European Region. World Health Organisation. 2018
10. Acoustics, Ventilation and Overheating. Residential Design Guide. Association of Noise Consultants. 2021.
11. Approved Document F – Ventilation (2010 edition incorporating 2010 and 2013 amendments). HM Government. 2015.
12. TM59 Design methodology for the assessment of overheating risk in homes. Chartered Institution of Building Services Engineers. 2017.
13. British Standards Institution. British Standard 4142+A1: Methods for rating and assessing industrial and commercial sound. 2014 + 2019.

14. Approved Document E - Resistance to the passage of sound (2003 Edition incorporating 2004, 2010, 2013 and 2015 amendments). HM Government. 2015.

Figures

Gravesham Borough Council



Key

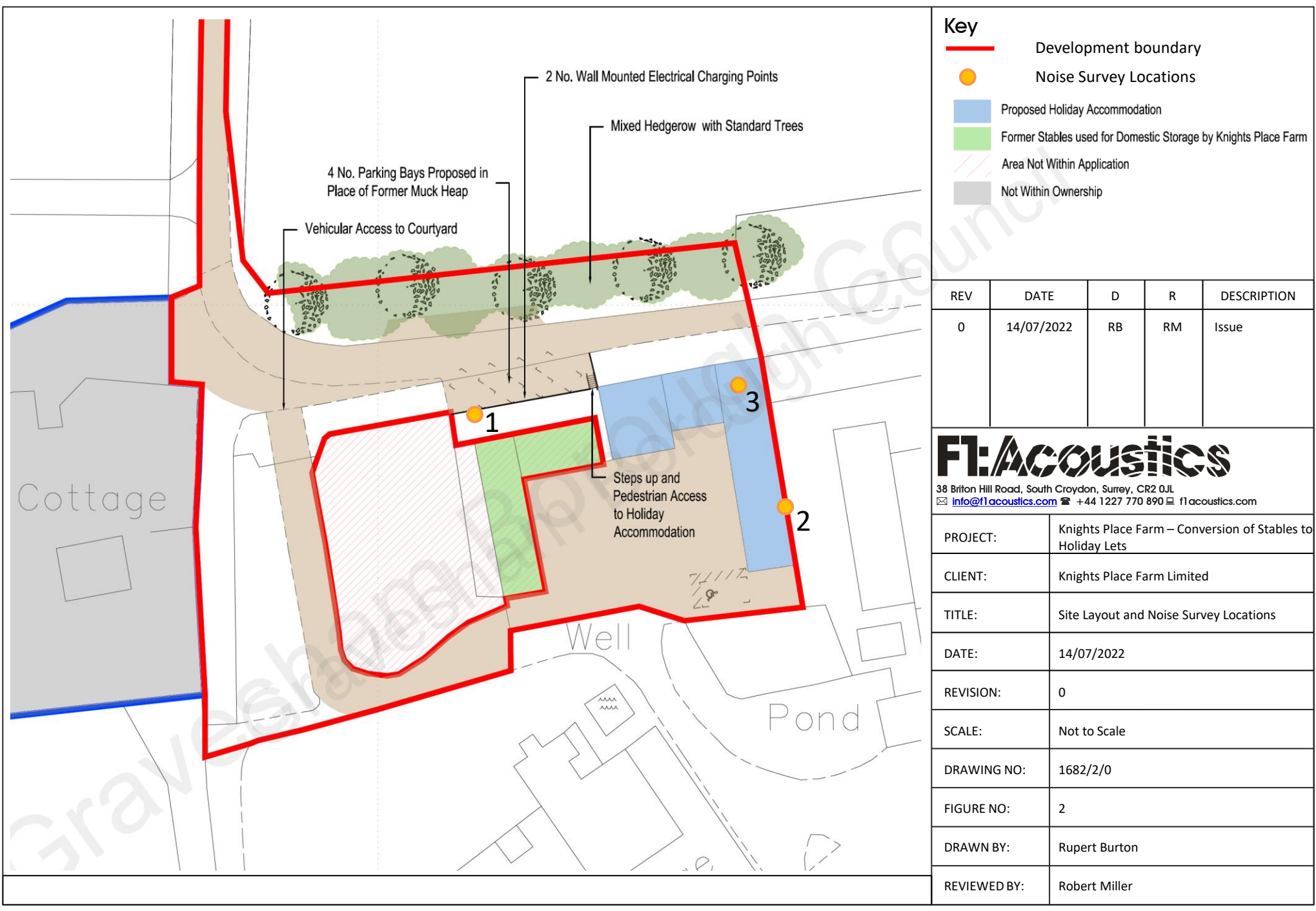
Development boundary

REV	DATE	D	R	DESCRIPTION
0	14/07/2022	RB	RM	Issue

F1:Acoustics

38 Briton Hill Road, South Croydon, Surrey, CR2 0JL
info@f1acoustics.com +44 1227 770 890 f1acoustics.com

PROJECT:	Knights Place Farm – Conversion of Stables to Holiday Lets
CLIENT:	Knights Place Farm Limited
TITLE:	Site Location Plan
DATE:	14/07/2022
REVISION:	0
SCALE:	Not to Scale
DRAWING NO:	1682/1/0
FIGURE NO:	1
DRAWN BY:	Rupert Burton
REVIEWED BY:	Robert Miller

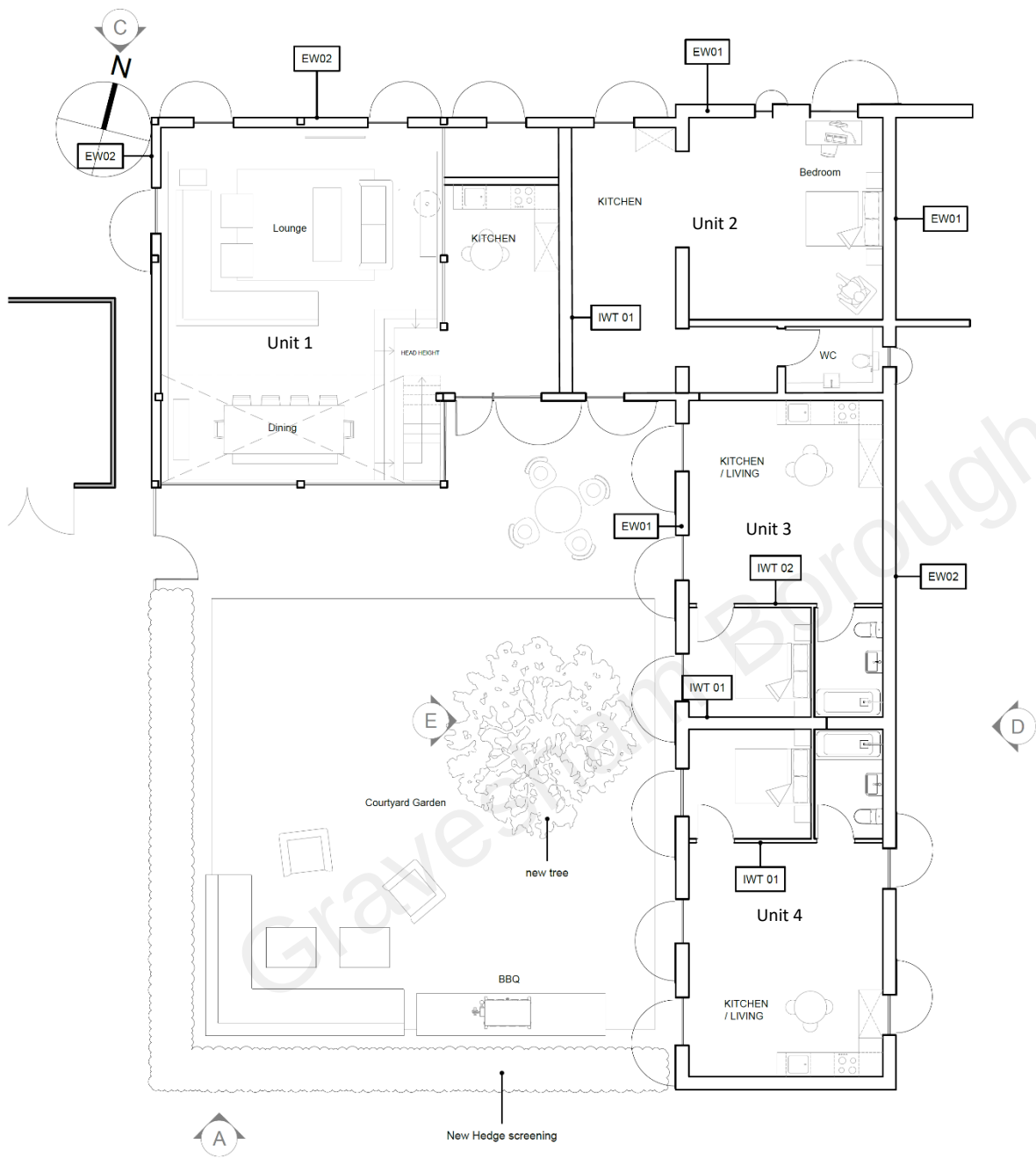


Key

- Development boundary
- Noise Survey Locations
- Proposed Holiday Accommodation
- Former Stables used for Domestic Storage by Knights Place Farm
- Area Not Within Application
- Not Within Ownership

REV	DATE	D	R	DESCRIPTION
0	14/07/2022	RB	RM	Issue

F1:Acoustics 38 Briton Hill Road, South Croydon, Surrey, CR2 0JL ✉ info@f1acoustics.com ☎ +44 1227 770 890 🌐 f1acoustics.com	
PROJECT:	Knights Place Farm – Conversion of Stables to Holiday Lets
CLIENT:	Knights Place Farm Limited
TITLE:	Site Layout and Noise Survey Locations
DATE:	14/07/2022
REVISION:	0
SCALE:	Not to Scale
DRAWING NO:	1682/2/0
FIGURE NO:	2
DRAWN BY:	Rupert Burton
REVIEWED BY:	Robert Miller



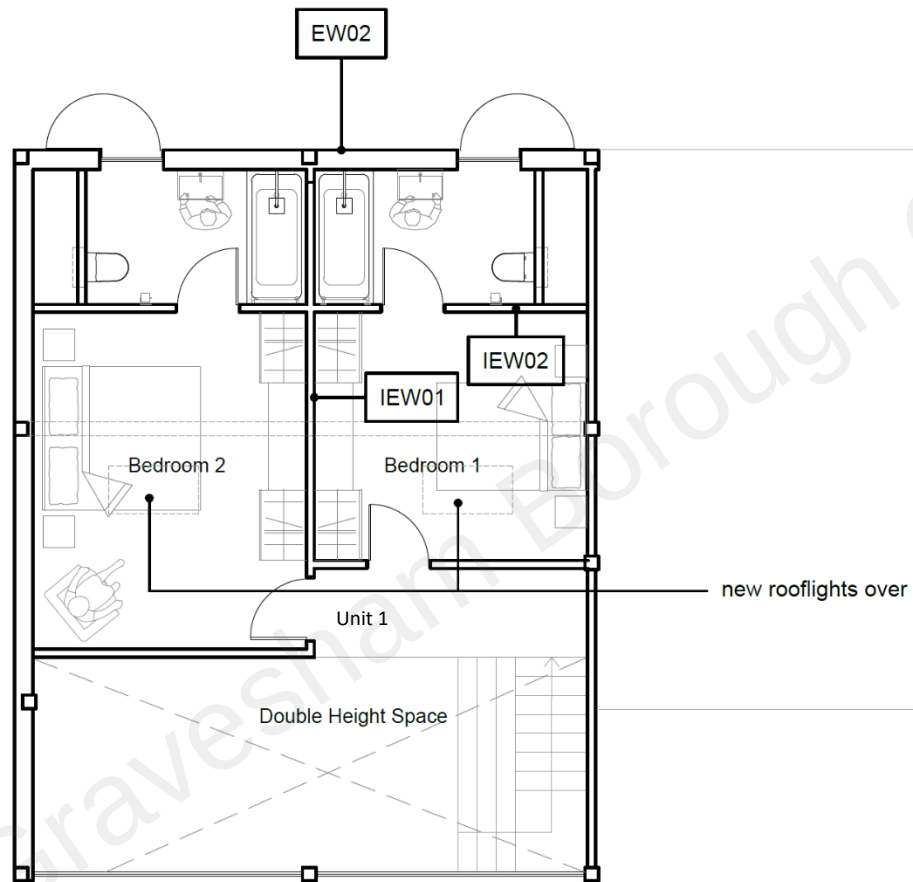
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REV	DATE	D	R	DESCRIPTION
0	14/07/2022	RB	RM	Issue

F1:Acoustics

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PROJECT:	Knights Place Farm – Conversion of Stables to Holiday Lets
CLIENT:	Knights Place Farm Limited
TITLE:	Proposed Ground Floor Plans
DATE:	14/07/2022
REVISION:	0
SCALE:	Not to Scale
DRAWING NO:	1682/3/0
FIGURE NO:	3
DRAWN BY:	Rupert Burton
REVIEWED BY:	Robert Miller



Key

REV	DATE	D	R	DESCRIPTION
0	14/07/2022	RB	RM	Issue

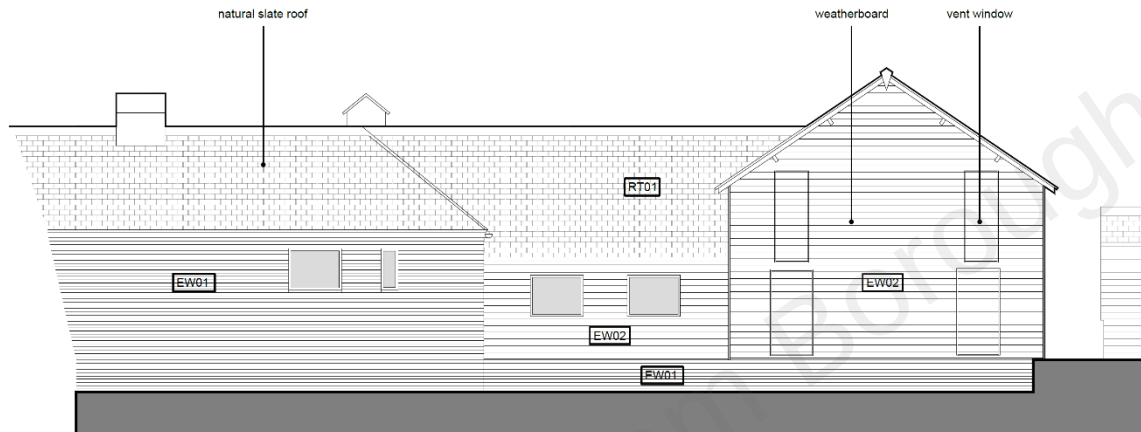
F1:Acoustics

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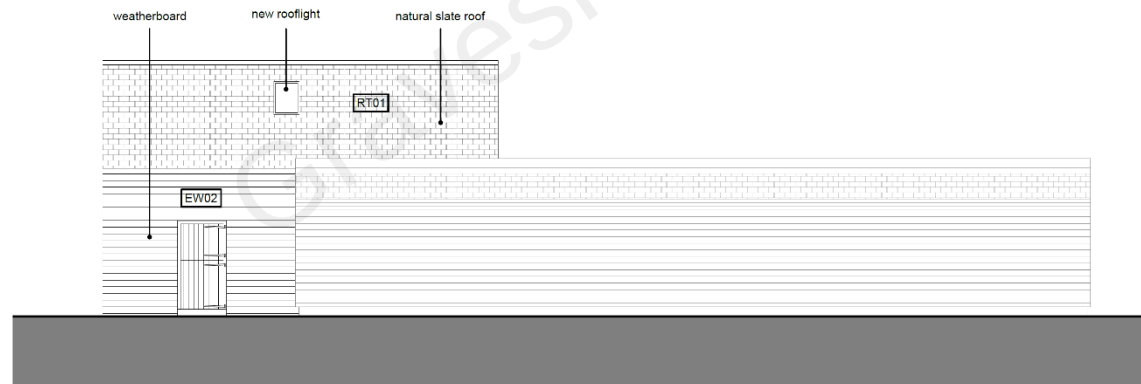
PROJECT:	Knights Place Farm – Conversion of Stables to Holiday Lets
CLIENT:	Knights Place Farm Limited
TITLE:	Mezzanine Floor Plans
DATE:	14/07/2022
REVISION:	0
SCALE:	Not to Scale
DRAWING NO:	1682/4/0
FIGURE NO:	4
DRAWN BY:	Rupert Burton
REVIEWED BY:	Robert Miller



ELEVATION A (South)



ELEVATION C (North)



ELEVATION B (West)

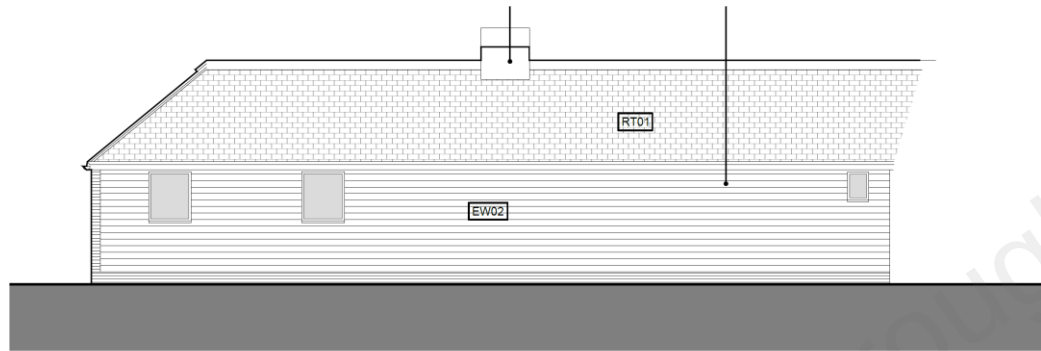
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REV	DATE	D	R	DESCRIPTION
0	14/07/2022	RB	RM	Issue

F1:Acoustics

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PROJECT:	Knights Place Farm – Conversion of Stables to Holiday Lets
CLIENT:	Knights Place Farm Limited
TITLE:	Proposed Elevations (South / North / West)
DATE:	14/07/2022
REVISION:	0
SCALE:	Not to Scale
DRAWING NO:	1682/5/0
FIGURE NO:	5
DRAWN BY:	Rupert Burton
REVIEWED BY:	Robert Miller



ELEVATION D (East)



ELEVATION E (West)

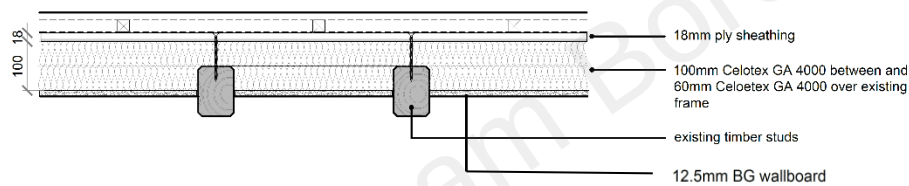
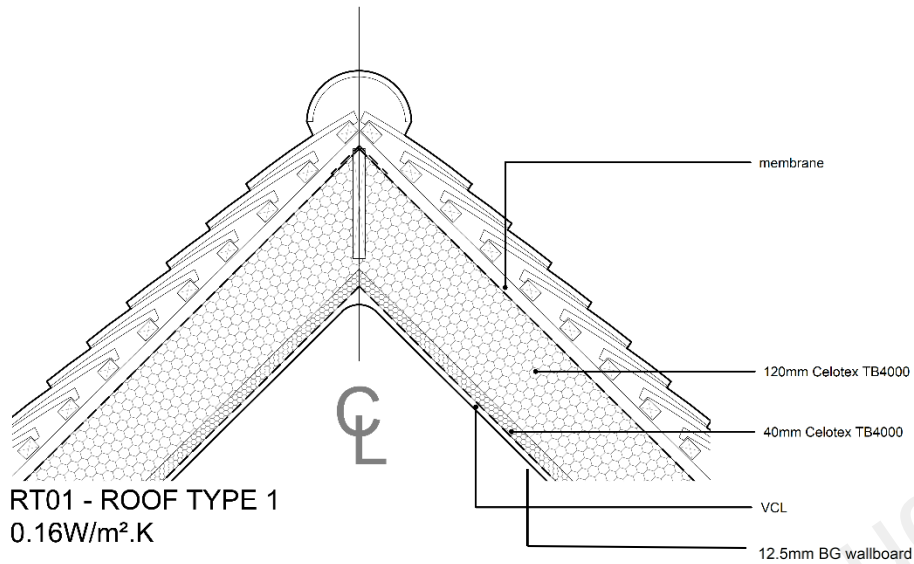
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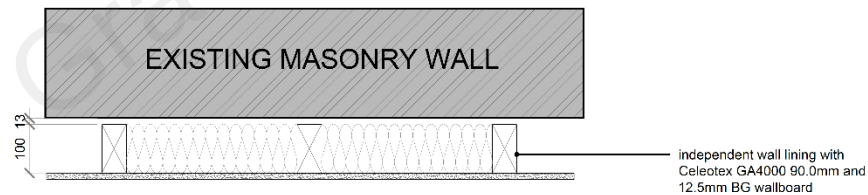
F1:Acoustics

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PROJECT:	Knights Place Farm – Conversion of Stables to Holiday Lets
CLIENT:	Knights Place Farm Limited
TITLE:	Proposed Elevations (East / West)
DATE:	14/07/2022
REVISION:	0
SCALE:	Not to Scale
DRAWING NO:	1682/6/0
FIGURE NO:	6
DRAWN BY:	Rupert Burton
REVIEWED BY:	Robert Miller



EW02 - Timber Frame cladding
0.16W/m².K



EW01 - masonry
0.19W/m².K

Key

REV	DATE	D	R	DESCRIPTION
0	14/07/2022	RB	RM	Issue

F1:Acoustics

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PROJECT:	Knights Place Farm – Conversion of Stables to Holiday Lets
CLIENT:	Knights Place Farm Limited
TITLE:	External Wall Constructions
DATE:	14/07/2022
REVISION:	0
SCALE:	Not to Scale
DRAWING NO:	1682/7/0
FIGURE NO:	7
DRAWN BY:	Rupert Burton
REVIEWED BY:	Robert Miller

Appendices

Appendix A

Detailed Unattended Noise Survey Results

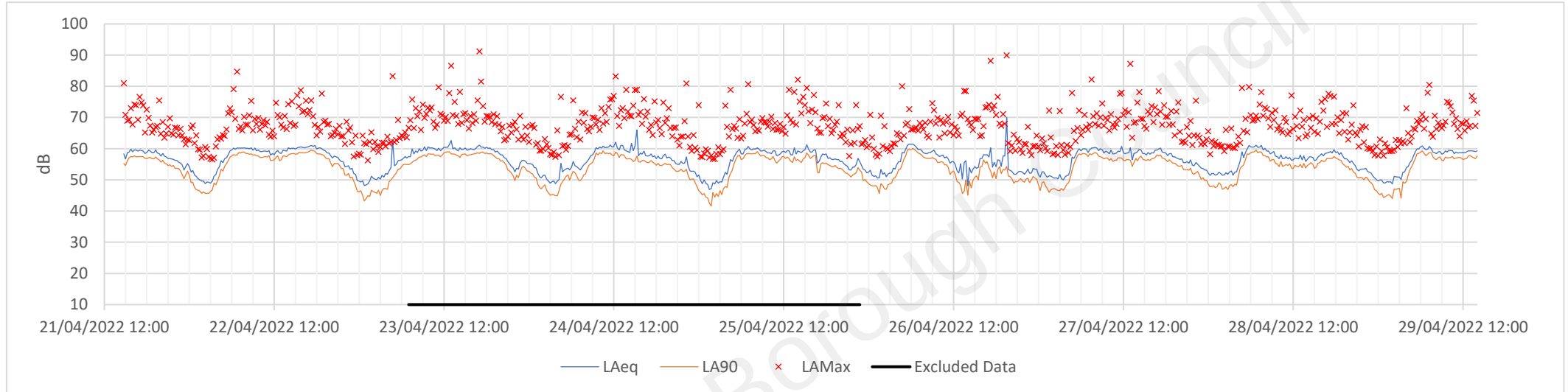
Unattended Noise Survey Summary

Project number: 1682
Project name: Knights Place Farm

Survey location ID: 1a

Start date & time: 21/04/2022 15:00
End date & time: 29/04/2022 14:00

Noise Level Data Summary Graph



Noise Survey Information

Instrumentation	ID	Make	Model
Sound Level Meter	F1AC-001	Rion	NL-52
Calibrator	F1AC-067	Rion	NC-74

Set-up personnel: RB

Collection personnel: RB

Field calibration check at start: 94.0 dB

Field calibration check at end: 93.9 dB

Microphone height: 1.5 m^{*1}

Façade location: No^{*2}

Measurement period (T): 15 minutes

Time weighting: fast

Photograph of Noise Survey Location

Noise survey microphone circled in red



¹ Height measured above local ground level.

² Façade location considered to be 1 m from a reflecting façade.

Unattended Noise Survey Summary

Project number:1682

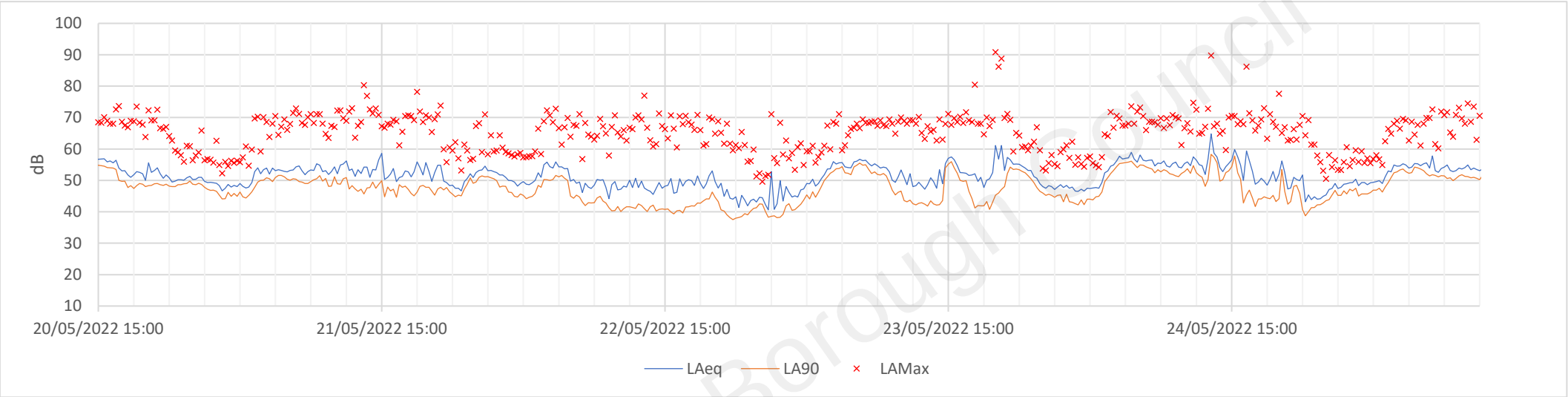
Project name:Knights Place Farm

Survey location ID:1b

Start date & time:20/05/2022 15:00

End date & time:25/05/2022 12:00

Noise Level Data Summary Graph



Noise Survey Information

Instrumentation	ID	Make	Model
Sound Level Meter	F1AC-001	Rion	NL-52
Calibrator	F1AC-067	Rion	NC-74

Set-up personnel:RB

Collection personnel:RB

Field calibration check at start:94.0dB

Field calibration check at end:94.0dB

Microphone height:1.5m^{*1}

Façade location:No^{*2}

Measurement period (T):15minutes

Time weighting:fast

Photograph of Noise Survey Location



¹ Height measured above local ground level.
² Façade location considered to be 1 m from a reflecting façade.

Unattended Noise Survey Summary

Project number:1682

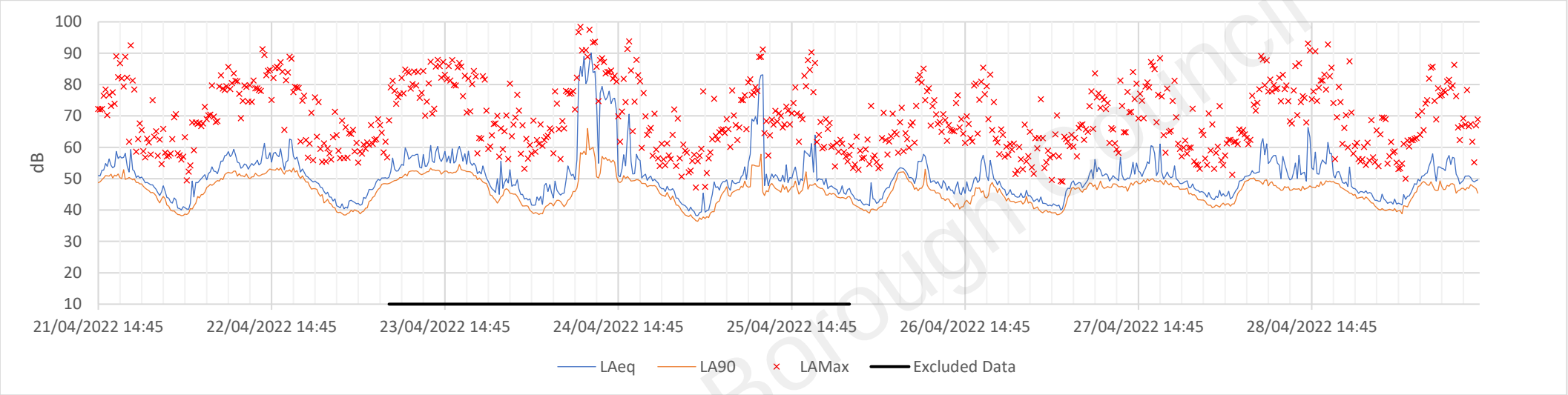
Project name:Knights Place Farm

Survey location ID:2a

Start date & time:21/04/2022 15:00

End date & time:29/04/2022 13:45

Noise Level Data Summary Graph



Noise Survey Information

Instrumentation	ID	Make	Model
Sound Level Meter	F1AC-002	Rion	NL-52
Calibrator	F1AC-067	Rion	NC-74

Set-up personnel:RB

Collection personnel:RB

Field calibration check at start:94.0dB

Field calibration check at end:93.9dB

Microphone height:2.2m^{*1}

Façade location:Yes^{*2}

Measurement period (T):15minutes

Time weighting:fast

Photograph of Noise Survey Location



¹ Height measured above local ground level.

² Façade location considered to be 1 m from a reflecting façade.

Unattended Noise Survey Summary

Project number:1682

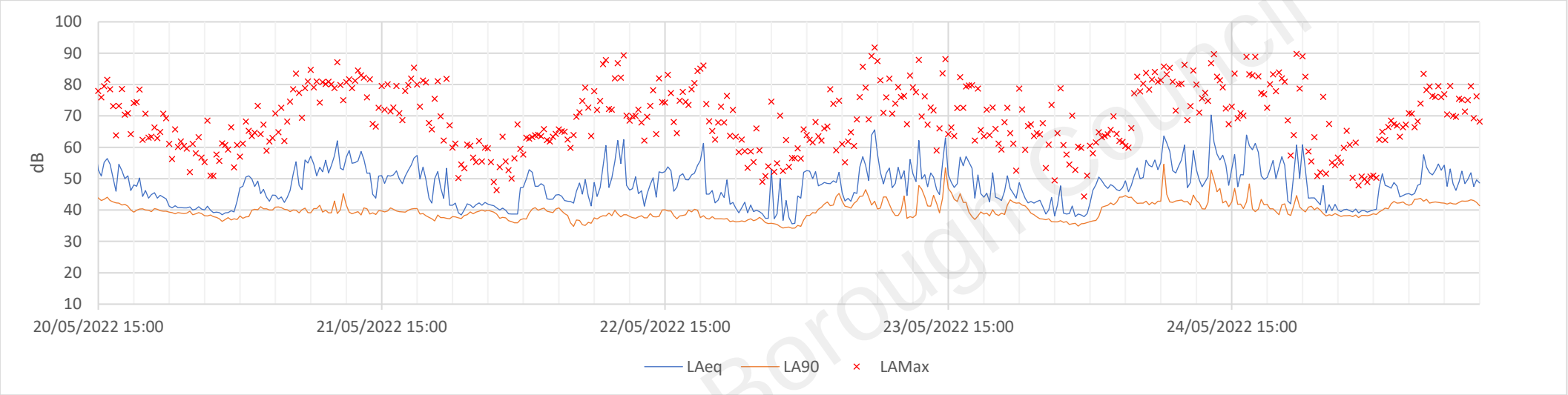
Project name:Knights Place Farm

Survey location ID:2b

Start date & time:20/05/2022 15:00

End date & time:25/05/2022 12:00

Noise Level Data Summary Graph



Noise Survey Information

Instrumentation	ID	Make	Model
Sound Level Meter	F1AC-002	Rion	NL-52
Calibrator	F1AC-067	Rion	NC-74

Set-up personnel:RB

Collection personnel:RB

Field calibration check at start:94.0dB

Field calibration check at end:93.9dB

Microphone height:2.2m^{*1}

Façade location:Yes^{*2}

Measurement period (T):15minutes

Time weighting:fast

Photograph of Noise Survey Location



¹ Height measured above local ground level.
² Façade location considered to be 1 m from a reflecting façade.

Appendix B

Habitable Room Information

Unit	Floor	Room Code	Room	Façade facing	Room dimensions / m		Façade dimensions / m		Roof dimensions / m		Door dimensions / m		Windows dimensions / m	
					H	Area	H	W	H	W	H	W	H	W
1	0	LD	Living/Dining	N	3.3/1.4	62.8/18.8	3.3	7.2	-	-	-	-	2.0	2.0
1	0	LD	Living/Dining	E	3.3/1.4	62.8/18.8	3.3	2.1	-	-	-	-	-	-
1	0	LD	Living/Dining	S	3.3/1.4	62.8/18.8	Area = 35 m ²		-	-	-	-	3.0	6.2
1	0	LD	Living/Dining	W	3.3/1.4	62.8/18.8	3.3	9.2	-	-	-	-	2.2	1.1
1	1	B1	Bedroom 1	E	2.8	10.8	-	-	3.1	3.8	-	-	0.6	1.1
1	1	B2	Bedroom 2	W	2.8	14.6	-	-	4.3	3.8	-	-	0.6	1.1
2	0	LKB	Living/Kitchen/Bedroom	N	4.0	43.7	3.2	8.2	2.9	8.2	-	-	1.0	2.4
2	0	LKB	Living/Kitchen/Bedroom	S	4.0	43.7	3.2	2.9	2.9	2.9	2.2	1.1	-	-
3	0	LDK	Living/Dining/Kitchen	E	4.0	24.2	2.9	5.1	2.2	5.1	-	-	-	-
3	0	LDK	Living/Dining/Kitchen	W	4.0	24.2	2.9	5.1	2.2	5.1	2.5	1.1	2.5	1.1
3	0	B1	Bedroom 1	W	4.0	8.2	2.9	2.9	2.2	2.9	-	-	2.5	1.1
4	0	LDK	Living/Dining/Kitchen	E	4.0	28.0	2.9	5.1	2.2	5.1	-	-	1.0	2.4
4	0	LDK	Living/Dining/Kitchen	S	4.0	28.0	2.9	5.1	2.2	5.1	-	-	-	-
4	0	LDK	Living/Dining/Kitchen	W	4.0	28.0	2.9	5.1	2.2	5.1	2.5	1.1	2.5	1.1
4	0	B1	Bedroom 1	W	4.0	8.2	2.9	2.9	2.2	2.9	-	-	2.5	1.1

Appendix C

BS 8233 Noise Assessment – Open Windows

Unit	Floor	Room Code	Room	Façade facing	Free-field External Noise Level, dB			Attenuation for Open Window, dB	Internal Noise Level, dB			Combined Internal Noise Level, dB			Internal Criteria, dB			Criteria Achieved?		
					Day LAeq	Night LAeq	Night LAmaz		Day LAeq	Night LAeq	Night LAmaz	Day LAeq	Night LAeq	Night LAmaz	Day LAeq	Night LAeq	Night LAmaz	Day LAeq	Night LAeq	Night LAmaz
1	0	LD	Living/Dining	N	57	54	64	-13	44											
1	0	LD	Living/Dining	E	51	44	62	-13	38			48			35			No		
1	0	LD	Living/Dining	S	51	44	62	-13	38											
1	0	LD	Living/Dining	W	57	54	64	-13	44											
1	1	B1	Bedroom 1	E	51	44	62	-13	38	31	49	38	31	49	35	30	45	No	No	No
1	1	B2	Bedroom 2	W	57	54	64	-13	44	41	51	44	41	51	35	30	45	No	No	No
2	0	LKB	Living/Kitchen/Bedroom	N	57	54	64	-13	44	41	51									
2	0	LKB	Living/Kitchen/Bedroom	S	51	44	62	-13	38	31	49	45	41	53	35	30	45	No	No	No
3	0	LDK	Living/Dining/Kitchen	E	51	44	62	-13	38			43			35			No		
3	0	LDK	Living/Dining/Kitchen	W	54	47	65	-13	41											
3	0	B1	Bedroom 1	W	54	47	65	-13	41	34	52	41	34	52	35	30	45	No	No	No
4	0	LDK	Living/Dining/Kitchen	E	51	44	62	-13	38											
4	0	LDK	Living/Dining/Kitchen	S	51	44	62	-13	38			44			35			No		
4	0	LDK	Living/Dining/Kitchen	W	54	47	65	-13	41											
4	0	B1	Bedroom 1	W	54	47	65	-13	41	34	52	41	34	52	35	30	45	No	No	No

Appendix D

BS 8233 Detailed Noise Assessment Calculations – Closed Windows

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	1-0-N-LD
Façade facing	North

RESULT SUMMARY - Day

Predicted internal level	27 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-8 dB	LAeq,T

ROOM DIMENSIONS

External wall length	7.2 m
External wall height	3.3 m
External roof length	- m
External roof height	- m
Room height	3.3/1.4 m
Floor/ceiling area	62.8/18.8 m ²
External window area S_{wi}	4.0 m ²
External door area S_{do}	- m ²
External wall area S_{ew}	19.8 m ²
External roof area S_{rr}	- m ²
Total façade area S_f	23.8 m ²
Total area of elements S	23.8 m ²
Room volume V	226.0 m ³

GLOBAL PROPERTIES

External noise level	Free-field	Façade correction	0 dB
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	Octave band centre frequency, Hz							Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5	
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1
Daytime External noise level Leq, dB		53.2	52.1	53.2	54	45.4	44	56.4
Corrected daytime external noise level (L1) Leq, dB(A)		53.2	52.1	53.2	54	45.4	44	0

ELEMENT SELECTION

Element	Type	Description	R_w	R_w+C_{tr}	$D_{n,e}+C_{tr}$
1	Wall	EW02 - Timber Frame Cladding	38	29	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door	-	-	-
4	Ventilator	Vent ($D_{n,e}$ 27 dB, $D_{n,e}+C_{tr}$ 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)
		63	125	250	500	1000	2000	4000	8000

Element 1 Wall

L1 Day (free-field)		53.2	52.1	53.2	54	45.4	44		56.4
-R _{ew}	EW02 - Timber Frame Cladding	-15	-27	-37	-44	-46	-52		
+10logS	(S=element area)	12.958	12.958	12.958	12.958	12.958	12.958		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		35.5	22.4	13.5	7.3	-3.3	-10.7		21.1

Element 2 Windows

L1 Day (free-field)		53.2	52.1	53.2	54	45.4	44		56.4
-R _{ew}	4-(6-16)-4	-21	-17	-25	-35	-37	-31		
+10logS	(S=element area)	6.0206	6.0206	6.0206	6.0206	6.0206	6.0206		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		22.6	25.5	18.6	9.4	-1.2	3.4		19.8

Element 3 Door

L1 Day (free-field)		53.2	52.1	53.2	54	45.4	44		56.4
-R _{do}	25kg/m2 well sealed door	-20	-25	-27	-28	-32	-32		
+10logS	(S=element area)	0	0	0	0	0	0		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 4 Ventilator

L1 Day (free-field)		53.2	52.1	53.2	54	45.4	44		56.4
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)	-33.4	-26.6	-27.1	-28.4	-25.5	-27		
+10logS ₀	(S ₀ =reference area)	10	10	10	10	10	10		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		14.2	19.9	20.5	20.0	14.3	11.4		23.3

Element 5 Roof

L1 Day (free-field)		53.2	52.1	53.2	54	45.4	44		56.4
-R _{rr}		-21	-37	-46	-52	-52	-50		
+10logS	(S=element area)	0	0	0	0	0	0		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		0.0	0.0	0.0	0.0	0.0	0.0		0.0

Total of All Elements

=L2 Day		35.8	28	23.2	20.6	14.8	12.6		26.5
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BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	1-0-E-LD
Façade facing	East

RESULT SUMMARY - Day

Predicted internal level	20 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-15 dB	LAeq,T

ROOM DIMENSIONS

External wall length	2.1 m
External wall height	3.3 m
External roof length	- m
External roof height	- m
Room height	3.3/1.4 m
Floor/ceiling area	62.8/18.8 m ²
External window area S_{wi}	- m ²
External door area S_{do}	- m ²
External wall area S_{ew}	7.1 m ²
External roof area S_{rr}	- m ²
Total façade area S_f	7.1 m ²
Total area of elements S	7.1 m ²
Room volume V	226.0 m ³

GLOBAL PROPERTIES

External noise level	Façade	Façade correction	-3 dB
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	Octave band centre frequency, Hz							Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5	
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1
Daytime External noise level Leq, dB		49.9	48.7	48.4	50	48.6	42.6	54.1
Corrected daytime external noise level (L1) Leq, dB(A)		46.9	45.7	45.4	47	45.6	39.6	51.1

ELEMENT SELECTION

Element	Type	Description	R_w	R_w+C_{tr}	$D_{n,e}+C_{tr}$
1	Wall	EW02 - Timber Frame Cladding	38	29	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door	-	-	-
4	Ventilator	Vent ($D_{n,e}$ 27 dB, $D_{n,e}+C_{tr}$ 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)
		63	125	250	500	1000	2000	4000	8000

Element 1 Wall

L1 Day (free-field)		46.9	45.7	45.4	47	45.6	39.6		51.1
-R _{ew}	EW02 - Timber Frame Cladding	-15	-27	-37	-44	-46	-52		
+10logS	(S=element area)	8.4893	8.4893	8.4893	8.4893	8.4893	8.4893		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		24.8	11.6	1.3	-4.1	-7.5	-19.5		10.5

Element 2 Windows

L1 Day (free-field)		46.9	45.7	45.4	47	45.6	39.6		51.1
-R _{ew}	4-(6-16)-4	-21	-17	-25	-35	-37	-31		
+10logS	(S=element area)	0	0	0	0	0	0		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 3 Door

L1 Day (free-field)		46.9	45.7	45.4	47	45.6	39.6		51.1
-R _{do}	25kg/m2 well sealed door	-20	-25	-27	-28	-32	-32		
+10logS	(S=element area)	0	0	0	0	0	0		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 4 Ventilator

L1 Day (free-field)		46.9	45.7	45.4	47	45.6	39.6		51.1
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)	-33.4	-26.6	-27.1	-28.4	-25.5	-27		
+10logS ₀	(S ₀ =reference area)	10	10	10	10	10	10		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		7.9	13.5	12.7	13.0	14.5	7.0		18.7

Element 5 Roof

L1 Day (free-field)		46.9	45.7	45.4	47	45.6	39.6		51.1
-R _{rr}		-21	-37	-46	-52	-52	-50		
+10logS	(S=element area)	0	0	0	0	0	0		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		0.0	0.0	0.0	0.0	0.0	0.0		0.0

Total of All Elements

=L2 Day		24.9	16	13.6	13.7	14.9	9		19.9
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BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	1-0-S-LD
Façade facing	South

RESULT SUMMARY - Day

Predicted internal level	23 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-12 dB	LAeq,T

ROOM DIMENSIONS

External wall length	-*	m	* area measured from drawings
External wall height	-*	m	* area measured from drawings
External roof length	-	m	
External roof height	-	m	
Room height	3.3/1.4	m	
Floor/ceiling area	62.8/18.8	m ²	
External window area	S _{wi}	18.6	m ²
External door area	S _{do}	-	m ²
External wall area	S _{ew}	16.4	m ²
External roof area	S _{rr}	-	m ²
Total façade area	S _f	35.0	m ²
Total area of elements	S	35.0	m ²
Room volume	V	226.0	m ³

GLOBAL PROPERTIES

External noise level	Façade	Façade correction	-3 dB
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	Octave band centre frequency, Hz							Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5	
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1
Daytime External noise level Leq, dB		49.9	48.7	48.4	50	48.6	42.6	54.1
Corrected daytime external noise level (L1) Leq, dB(A)		46.9	45.7	45.4	47	45.6	39.6	51.1

ELEMENT SELECTION

Element	Type	Description	R _w	R _w +C _{tr}	D _{n,e} +C _{tr}
1	Wall	EW02 - Timber Frame Cladding	38	29	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door	-	-	-
4	Ventilator	Vent (D _{n,e} 27 dB, D _{n,e} +C _{tr} 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)
		63	125	250	500	1000	2000	4000	
Element 1 Wall									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{ew}	EW02 - Timber Frame Cladding		-15	-27	-37	-44	-46	-52	
+10logS	(S=element area)		12.148	12.148	12.148	12.148	12.148	12.148	
-10logA	(A=0.161V/T)		-18.62	-18.62	-18.62	-18.62	-18.62	-18.62	
=L2 Day			28.4	15.2	4.9	-0.5	-3.9	-15.9	14.0
Element 2 Windows									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31	
+10logS	(S=element area)		12.695	12.695	12.695	12.695	12.695	12.695	
-10logA	(A=0.161V/T)		-18.62	-18.62	-18.62	-18.62	-18.62	-18.62	
=L2 Day			23.0	25.8	17.5	9.1	5.7	5.7	19.9
Element 3 Door									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32	
+10logS	(S=element area)		0	0	0	0	0	0	
-10logA	(A=0.161V/T)		-18.62	-18.62	-18.62	-18.62	-18.62	-18.62	
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0	0.0
Element 4 Ventilator									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)		-33.4	-26.6	-27.1	-28.4	-25.5	-27	
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10	
-10logA	(A=0.161V/T)		-18.62	-18.62	-18.62	-18.62	-18.62	-18.62	
=L2 Day			7.9	13.5	12.7	13.0	14.5	7.0	18.7
Element 5 Roof									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{rr}			-21	-37	-46	-52	-52	-50	
+10logS	(S=element area)		0	0	0	0	0	0	
-10logA	(A=0.161V/T)		-18.62	-18.62	-18.62	-18.62	-18.62	-18.62	
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total of All Elements									
=L2 Day			29.6	26.4	19	14.9	15.3	10.3	23.1

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	1-0-W-LD
Façade facing	West

RESULT SUMMARY - Day

Predicted internal level	27 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-8 dB	LAeq,T

ROOM DIMENSIONS

External wall length	9.2 m
External wall height	3.3 m
External roof length	- m
External roof height	- m
Room height	3.3/1.4 m
Floor/ceiling area	62.8/18.8 m ²
External window area S_{wi}	2.4 m ²
External door area S_{do}	- m ²
External wall area S_{ew}	27.9 m ²
External roof area S_{rr}	- m ²
Total façade area S_f	30.4 m ²
Total area of elements S	30.4 m ²
Room volume V	226.0 m ³

GLOBAL PROPERTIES

External noise level	Free-field	Façade correction	0 dB
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	Octave band centre frequency, Hz							Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5	
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1
Daytime External noise level Leq, dB		53.2	52.1	53.2	54	45.4	44	56.4
Corrected daytime external noise level (L1) Leq, dB(A)		53.2	52.1	53.2	54	45.4	44	0

ELEMENT SELECTION

Element	Type	Description	R_w	R_w+C_{tr}	$D_{n,e}+C_{tr}$
1	Wall	EW02 - Timber Frame Cladding	38	29	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door	-	-	-
4	Ventilator	Vent ($D_{n,e}$ 27 dB, $D_{n,e}+C_{tr}$ 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)
		63	125	250	500	1000	2000	4000	8000

Element 1 Wall

L1 Day (free-field)		53.2	52.1	53.2	54	45.4	44		56.4
-R _{ew}	EW02 - Timber Frame Cladding	-15	-27	-37	-44	-46	-52		
+10logS	(S=element area)	14.462	14.462	14.462	14.462	14.462	14.462		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		37.0	23.9	15.0	8.8	-1.8	-9.2		22.6

Element 2 Windows

L1 Day (free-field)		53.2	52.1	53.2	54	45.4	44		56.4
-R _{ew}	4-(6-16)-4	-21	-17	-25	-35	-37	-31		
+10logS	(S=element area)	3.8382	3.8382	3.8382	3.8382	3.8382	3.8382		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		20.4	23.3	16.4	7.2	-3.4	1.2		17.7

Element 3 Door

L1 Day (free-field)		53.2	52.1	53.2	54	45.4	44		56.4
-R _{do}	25kg/m2 well sealed door	-20	-25	-27	-28	-32	-32		
+10logS	(S=element area)	0	0	0	0	0	0		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 4 Ventilator

L1 Day (free-field)		53.2	52.1	53.2	54	45.4	44		56.4
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)	-33.4	-26.6	-27.1	-28.4	-25.5	-27		
+10logS ₀	(S ₀ =reference area)	10	10	10	10	10	10		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		14.2	19.9	20.5	20.0	14.3	11.4		23.3

Element 5 Roof

L1 Day (free-field)		53.2	52.1	53.2	54	45.4	44		56.4
-R _{rr}		-21	-37	-46	-52	-52	-50		
+10logS	(S=element area)	0	0	0	0	0	0		
-10logA	(A=0.161V/T)	-18.62	-18.62	-18.62	-18.62	-18.62	-18.62		
=L2 Day		0.0	0.0	0.0	0.0	0.0	0.0		0.0

Total of All Elements

=L2 Day		37.2	27.5	22.8	20.6	14.8	12.4		26.6
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BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	1-1-E-B1
Façade facing	East

RESULT SUMMARY - Day

Predicted internal level	28 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-7 dB	LAeq,T

RESULT SUMMARY - Night

Predicted internal level	20 dB	LAeq,T	38 dB	LAMax,T
Internal level criterion	30 dB	LAeq,T	45 dB	LAMax,T
Difference	-10 dB	LAeq,T	-7 dB	LAMax,T

ROOM DIMENSIONS

External wall length	-	m
External wall height	-	m
External roof length	3.8	m
External roof height	3.1	m
Room height	2.8	m
Floor/ceiling area	10.8	m ²
External window area	S _{wi}	0.7 m ²
External door area	S _{do}	- m ²
External wall area	S _{ew}	- m ²
External roof area	S _{rr}	11.1 m ²
Total façade area	S _f	11.7 m ²
Total area of elements	S	11.7 m ²
Room volume	V	30.2 m ³

GLOBAL PROPERTIES

External noise level	Façade	Façade correction	-3 dB
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	Octave band centre frequency, Hz								Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000	
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5		
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1	
Daytime External noise level Leq, dB		49.9	48.7	48.4	50	48.6	42.6		54.1
Corrected daytime external noise level (L1) Leq, dB(A)	0	46.9	45.7	45.4	47	45.6	39.6	0	51.1
Night-time External noise level Leq, dB		43.1	42.9	41.9	42.7	37.3	38.8		46.5
Corrected night-time external noise level (L1) Leq, dB	0	40.1	39.9	38.9	39.7	34.3	35.8	0	43.5
Night-time External noise level Lmax, dB		57.4	56.9	58.6	60.5	58.8	56.2		64.8
Corrected night-time external noise level (L1) Lmax, dB	0	54.4	53.9	55.6	57.5	55.8	53.2	0	61.8

ELEMENT SELECTION

Element	Type	Description	R _w	R _w +C _{tr}	D _{n,e} +C _{tr}
1	Wall	EW02 - Timber Frame Cladding	38	29	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door			-
4	Ventilator	Vent (D _{n,e} 27 dB, D _{n,e} +C _{tr} 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)	
		63	125	250	500	1000	2000	4000		8000
Element 1	Wall									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
L1 Night (free-field)			40.1	39.9	38.9	39.7	34.3	35.8		43.5
L1 Night Max (free-field)			54.4	53.9	55.6	57.5	55.8	53.2		61.8
-R _{ew}	EW02 - Timber Frame Cladding		-15	-27	-37	-44	-46	-52		
+10logS	(S=element area)		0	0	0	0	0	0		
-10logA	(A=0.161V/T)		-9.884	-9.884	-9.884	-9.884	-9.884	-9.884		
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0		
=L2 Night			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night Max			0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 2 Windows										
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
L1 Night (free-field)			40.1	39.9	38.9	39.7	34.3	35.8		43.5
L1 Night Max (free-field)			54.4	53.9	55.6	57.5	55.8	53.2		61.8
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31		
+10logS	(S=element area)		-1.805	-1.805	-1.805	-1.805	-1.805	-1.805		
-10logA	(A=0.161V/T)		-9.884	-9.884	-9.884	-9.884	-9.884	-9.884		
=L2 Day			17.2	20.0	11.7	3.3	-0.1	-0.1		14.3
=L2 Night			10.4	14.2	5.2	-4.0	-11.4	-3.9		8.5
=L2 Night Max			24.7	28.2	21.9	13.8	10.1	13.5		23.6

Element 3 Door										
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
L1 Night (free-field)			40.1	39.9	38.9	39.7	34.3	35.8		43.5
L1 Night Max (free-field)			54.4	53.9	55.6	57.5	55.8	53.2		61.8
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32		
+10logS	(S=element area)		0	0	0	0	0	0		
-10logA	(A=0.161V/T)		-9.884	-9.884	-9.884	-9.884	-9.884	-9.884		
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night Max			0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 4 Ventilator										
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
L1 Night (free-field)			40.1	39.9	38.9	39.7	34.3	35.8		43.5
L1 Night Max (free-field)			54.4	53.9	55.6	57.5	55.8	53.2		61.8
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)		-33.4	-26.6	-27.1	-28.4	-25.5	-27		
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10		
-10logA	(A=0.161V/T)		-9.884	-9.884	-9.884	-9.884	-9.884	-9.884		
=L2 Day			16.6	22.2	21.4	21.7	23.2	15.7		27.4
=L2 Night			9.8	16.4	14.9	14.4	11.9	11.9		19.4
=L2 Night Max			24.1	30.4	31.6	32.2	33.4	29.3		38.1

Element 5 Roof										
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
L1 Night (free-field)			40.1	39.9	38.9	39.7	34.3	35.8		43.5
L1 Night Max (free-field)			54.4	53.9	55.6	57.5	55.8	53.2		61.8
-R _{rr}	Tiled roof, 12.5mm wall board ceiling		-21	-37	-46	-52	-52	-50		
+10logS	(S=element area)		10.437	10.437	10.437	10.437	10.437	10.437		
-10logA	(A=0.161V/T)		-9.884	-9.884	-9.884	-9.884	-9.884	-9.884		
=L2 Day			29.5	12.3	3.0	-1.4	-2.8	-6.8		14.3
=L2 Night			22.7	6.5	-3.5	-8.7	-14.1	-10.6		8.0
=L2 Night Max			37.0	20.5	13.2	9.1	7.4	6.8		22.2

Total of All Elements										
=L2 Day			29.9	24.6	22	21.9	23.3	16.1		27.9
=L2 Night			23.2	18.8	15.7	14.8	12.5	12.6		20.3
=L2 Night Max			37.4	32.7	32.1	32.3	33.5	29.5		38.3

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	1-1-W-B2
Façade facing	West

RESULT SUMMARY - Day

Predicted internal level	31 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-4 dB	LAeq,T

RESULT SUMMARY - Night

Predicted internal level	29 dB	LAeq,T	39 dB	LAMax,T
Internal level criterion	30 dB	LAeq,T	45 dB	LAMax,T
Difference	-1 dB	LAeq,T	-6 dB	LAMax,T

ROOM DIMENSIONS

External wall length	-	m
External wall height	-	m
External roof length	3.8	m
External roof height	4.3	m
Room height	2.8	m
Floor/ceiling area	14.6	m ²
External window area	S _{wi}	0.7 m ²
External door area	S _{do}	- m ²
External wall area	S _{ew}	- m ²
External roof area	S _{rr}	15.4 m ²
Total façade area	S _f	16.1 m ²
Total area of elements	S	16.1 m ²
Room volume	V	40.9 m ³

GLOBAL PROPERTIES

External noise level	Freefield	Façade correction	0 dB
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	Octave band centre frequency, Hz								Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000	
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5		
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1	
Daytime External noise level Leq, dB		53.2	52.1	53.2	54	45.4	44		56.4
Corrected daytime external noise level (L1) Leq, dB(A)	0	53.2	52.1	53.2	54	45.4	44	0	56.4
Night-time External noise level Leq, dB		46.9	49.2	51.4	51.7	43.5	39.6		54.1
Corrected night-time external noise level (L1) Leq, dB	0	46.9	49.2	51.4	51.7	43.5	39.6	0	54.1
Night-time External noise level Lmax, dB		55.8	61.6	63.8	55.4	55.5	55.2		63.8
Corrected night-time external noise level (L1) Lmax, dB	0	55.8	61.6	63.8	55.4	55.5	55.2	0	63.8

ELEMENT SELECTION

Element	Type	Description	R _w	R _w +C _{tr}	D _{n,e} +C _{tr}
1	Wall	EW02 - Timber Frame Cladding	38	29	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door			-
4	Ventilator	Vent (D _{n,e} 27 dB, D _{n,e} +C _{tr} 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)		
		63	125	250	500	1000	2000	4000		8000	
Element 1	Wall										
L1 Day (free-field)			53.2	52.1	53.2	54	45.4	44		56.4	
L1 Night (free-field)			46.9	49.2	51.4	51.7	43.5	39.6		54.1	
L1 Night Max (free-field)			55.8	61.6	63.8	55.4	55.5	55.2		63.8	
-R _{ew}	EW02 - Timber Frame Cladding		-15	-27	-37	-44	-46	-52			
+10logS	(S=element area)		0	0	0	0	0	0			
-10logA	(A=0.161V/T)		-11.19	-11.19	-11.19	-11.19	-11.19	-11.19			
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0			0.0
=L2 Night			0.0	0.0	0.0	0.0	0.0	0.0			0.0
=L2 Night Max			0.0	0.0	0.0	0.0	0.0	0.0		0.0	

Element 2 Windows										
L1 Day (free-field)			53.2	52.1	53.2	54	45.4	44		56.4
L1 Night (free-field)			46.9	49.2	51.4	51.7	43.5	39.6		54.1
L1 Night Max (free-field)			55.8	61.6	63.8	55.4	55.5	55.2		63.8
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31		
+10logS	(S=element area)		-1.805	-1.805	-1.805	-1.805	-1.805	-1.805		
-10logA	(A=0.161V/T)		-11.19	-11.19	-11.19	-11.19	-11.19	-11.19		
=L2 Day			22.2	25.1	18.2	9.0	-1.6	3.0		19.4
=L2 Night			15.9	22.2	16.4	6.7	-3.5	-1.4		16.9
=L2 Night Max			24.8	34.6	28.8	10.4	8.5	14.2		28.9

Element 3 Door										
L1 Day (free-field)			53.2	52.1	53.2	54	45.4	44		56.4
L1 Night (free-field)			46.9	49.2	51.4	51.7	43.5	39.6		54.1
L1 Night Max (free-field)			55.8	61.6	63.8	55.4	55.5	55.2		63.8
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32		
+10logS	(S=element area)		0	0	0	0	0	0		
-10logA	(A=0.161V/T)		-11.19	-11.19	-11.19	-11.19	-11.19	-11.19		
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night Max			0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 4 Ventilator										
L1 Day (free-field)			53.2	52.1	53.2	54	45.4	44		56.4
L1 Night (free-field)			46.9	49.2	51.4	51.7	43.5	39.6		54.1
L1 Night Max (free-field)			55.8	61.6	63.8	55.4	55.5	55.2		63.8
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)		-33.4	-26.6	-27.1	-28.4	-25.5	-27		
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10		
-10logA	(A=0.161V/T)		-11.19	-11.19	-11.19	-11.19	-11.19	-11.19		
=L2 Day			21.6	27.3	27.9	27.4	21.7	18.8		30.7
=L2 Night			15.3	24.4	26.1	25.1	19.8	14.4		28.4
=L2 Night Max			24.2	36.8	38.5	28.8	31.8	30.0		38.8

Element 5 Roof										
L1 Day (free-field)			53.2	52.1	53.2	54	45.4	44		56.4
L1 Night (free-field)			46.9	49.2	51.4	51.7	43.5	39.6		54.1
L1 Night Max (free-field)			55.8	61.6	63.8	55.4	55.5	55.2		63.8
-R _{rr}	Tiled roof, 12.5mm wall board ceiling		-21	-37	-46	-52	-52	-50		
+10logS	(S=element area)		11.877	11.877	11.877	11.877	11.877	11.877		
-10logA	(A=0.161V/T)		-11.19	-11.19	-11.19	-11.19	-11.19	-11.19		
=L2 Day			35.9	18.8	10.9	5.7	-2.9	-2.3		20.7
=L2 Night			29.6	15.9	9.1	3.4	-4.8	-6.7		15.4
=L2 Night Max			38.5	28.3	21.5	7.1	7.2	8.9		25.4

Total of All Elements										
=L2 Day			36.2	29.7	28.4	27.5	21.8	19.1		31.4
=L2 Night			29.9	26.8	26.6	25.2	19.9	14.8		28.9
=L2 Night Max			38.8	39.2	39	28.9	31.8	30.2		39.4

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	2-0-N-LKB
Façade facing	North

RESULT SUMMARY - Day

Predicted internal level	25 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-10 dB	LAeq,T

RESULT SUMMARY - Night

Predicted internal level	23 dB	LAeq,T	32 dB	LAMax,T
Internal level criterion	30 dB	LAeq,T	45 dB	LAMax,T
Difference	-7 dB	LAeq,T	-13 dB	LAMax,T

ROOM DIMENSIONS

External wall length	8.2 m
External wall height	3.2 m
External roof length	8.2 m
External roof height	2.9 m
Room height	4.0 m
Floor/ceiling area	43.7 m ²
External window area S_{wi}	2.4 m ²
External door area S_{do}	- m ²
External wall area S_{ew}	23.3 m ²
External roof area S_{rr}	23.3 m ²
Total façade area S_f	49.0 m ²
Total area of elements S	49.0 m ²
Room volume V	173.7 m ³

GLOBAL PROPERTIES

External noise level	Freefield	Façade correction	0 dB
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	Octave band centre frequency, Hz								Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000	
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5		
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1	
Daytime External noise level Leq, dB		53.2	52.1	53.2	54	45.4	44		56.4
Corrected daytime external noise level (L1) Leq, dB(A)	0	53.2	52.1	53.2	54	45.4	44	0	56.4
Night-time External noise level Leq, dB		46.9	49.2	51.4	51.7	43.5	39.6		54.1
Corrected night-time external noise level (L1) Leq, dB	0	46.9	49.2	51.4	51.7	43.5	39.6	0	54.1
Night-time External noise level Lmax, dB		55.8	61.6	63.8	55.4	55.5	55.2		63.8
Corrected night-time external noise level (L1) Lmax, dB	0	55.8	61.6	63.8	55.4	55.5	55.2	0	63.8

ELEMENT SELECTION

Element	Type	Description	R_w	$R_w + C_{tr}$	$D_{n,e} + C_{tr}$
1	Wall	EW01 - Masonry	53	46	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door			-
4	Ventilator	Vent ($D_{n,e}$ 27 dB, $D_{n,e} + C_{tr}$ 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)	
		63	125	250	500	1000	2000	4000		8000
Element 1	Wall									
L1 Day (free-field)			53.2	52.1	53.2	54	45.4	44		56.4
L1 Night (free-field)			46.9	49.2	51.4	51.7	43.5	39.6		54.1
L1 Night Max (free-field)			55.8	61.6	63.8	55.4	55.5	55.2		63.8
-R _{ew}	EW01 - Masonry		-32	-41	-52	-57	-67	-66		
+10logS	(S=element area)		13.674	13.674	13.674	13.674	13.674	13.674		
-10logA	(A=0.161V/T)		-17.48	-17.48	-17.48	-17.48	-17.48	-17.48		
=L2 Day			20.4	10.3	0.4	-3.8	-22.4	-22.8		7.7
=L2 Night			14.1	7.4	-1.4	-6.1	-24.3	-27.2		4.3
=L2 Night Max			23.0	19.8	11.0	-2.4	-12.3	-11.6		13.9

Element 2 Windows										
L1 Day (free-field)			53.2	52.1	53.2	54	45.4	44		56.4
L1 Night (free-field)			46.9	49.2	51.4	51.7	43.5	39.6		54.1
L1 Night Max (free-field)			55.8	61.6	63.8	55.4	55.5	55.2		63.8
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31		
+10logS	(S=element area)		3.8021	3.8021	3.8021	3.8021	3.8021	3.8021		
-10logA	(A=0.161V/T)		-17.48	-17.48	-17.48	-17.48	-17.48	-17.48		
=L2 Day			21.5	24.4	17.5	8.3	-2.3	2.3		18.8
=L2 Night			15.2	21.5	15.7	6.0	-4.2	-2.1		16.2
=L2 Night Max			24.1	33.9	28.1	9.7	7.8	13.5		28.2

Element 3 Door										
L1 Day (free-field)			53.2	52.1	53.2	54	45.4	44		56.4
L1 Night (free-field)			46.9	49.2	51.4	51.7	43.5	39.6		54.1
L1 Night Max (free-field)			55.8	61.6	63.8	55.4	55.5	55.2		63.8
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32		
+10logS	(S=element area)		0	0	0	0	0	0		
-10logA	(A=0.161V/T)		-17.48	-17.48	-17.48	-17.48	-17.48	-17.48		
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night Max			0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 4 Ventilator										
L1 Day (free-field)			53.2	52.1	53.2	54	45.4	44		56.4
L1 Night (free-field)			46.9	49.2	51.4	51.7	43.5	39.6		54.1
L1 Night Max (free-field)			55.8	61.6	63.8	55.4	55.5	55.2		63.8
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)		-32.4	-33	-31	-27.2	-29.8	-32.7		
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10		
-10logA	(A=0.161V/T)		-17.48	-17.48	-17.48	-17.48	-17.48	-17.48		
=L2 Day			16.3	14.6	17.7	22.3	11.1	6.8		23.5
=L2 Night			10.0	11.7	15.9	20.0	9.2	2.4		21.2
=L2 Night Max			18.9	24.1	28.3	23.7	21.2	18.0		29.1

Element 5 Roof										
L1 Day (free-field)			53.2	52.1	53.2	54	45.4	44		56.4
L1 Night (free-field)			46.9	49.2	51.4	51.7	43.5	39.6		54.1
L1 Night Max (free-field)			55.8	61.6	63.8	55.4	55.5	55.2		63.8
-R _{rr}	Tiled roof, 12.5mm wall board ceiling		-21	-37	-46	-52	-52	-50		
+10logS	(S=element area)		13.665	13.665	13.665	13.665	13.665	13.665		
-10logA	(A=0.161V/T)		-17.48	-17.48	-17.48	-17.48	-17.48	-17.48		
=L2 Day			31.4	14.3	6.4	1.2	-7.4	-6.8		16.2
=L2 Night			25.1	11.4	4.6	-1.1	-9.3	-11.2		11.1
=L2 Night Max			34.0	23.8	17.0	2.6	2.7	4.4		20.9

Total of All Elements										
=L2 Day			32.2	25.4	20.9	22.6	11.7	8.9		25.4
=L2 Night			25.9	22.5	19.1	20.3	9.9	5.4		22.8
=L2 Night Max			34.8	34.9	31.4	24	21.5	19.5		32.1

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	2-0-S-LKB
Façade facing	South

RESULT SUMMARY - Day

Predicted internal level	20 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-15 dB	LAeq,T

RESULT SUMMARY - Night

Predicted internal level	13 dB	LAeq,T	30 dB	LAMax,T
Internal level criterion	30 dB	LAeq,T	45 dB	LAMax,T
Difference	-17 dB	LAeq,T	-15 dB	LAMax,T

ROOM DIMENSIONS

External wall length	2.9 m
External wall height	3.2 m
External roof length	2.9 m
External roof height	2.9 m
Room height	4.0 m
Floor/ceiling area	43.7 m ²
External window area	S _{wi} - m ²
External door area	S _{do} 2.4 m ²
External wall area	S _{ew} 6.7 m ²
External roof area	S _{rr} 8.3 m ²
Total façade area	S _f 17.4 m ²
Total area of elements	S 17.4 m ²
Room volume	V 173.7 m ³

GLOBAL PROPERTIES

External noise level	Façade	Façade correction	-3 dB
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	Octave band centre frequency, Hz								Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000	
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5		
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1	
Daytime External noise level Leq, dB		49.9	48.7	48.4	50	48.6	42.6		54.1
Corrected daytime external noise level (L1) Leq, dB(A)	0	46.9	45.7	45.4	47	45.6	39.6	0	51.1
Night-time External noise level Leq, dB		43.1	42.9	41.9	42.7	37.3	38.8		46.5
Corrected night-time external noise level (L1) Leq, dB	0	40.1	39.9	38.9	39.7	34.3	35.8	0	43.5
Night-time External noise level Lmax, dB		57.4	56.9	58.6	60.5	58.8	56.2		64.8
Corrected night-time external noise level (L1) Lmax, dB	0	54.4	53.9	55.6	57.5	55.8	53.2	0	61.8

ELEMENT SELECTION

Element	Type	Description	R _w	R _w +C _{tr}	D _{n,e} +C _{tr}
1	Wall	EW02 - Timber Frame Cladding	38	29	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door			-
4	Ventilator	Vent (D _{n,e} 27 dB, D _{n,e} +C _{tr} 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)	
		63	125	250	500	1000	2000	4000		8000
Element 1	Wall									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
L1 Night (free-field)			40.1	39.9	38.9	39.7	34.3	35.8		43.5
L1 Night Max (free-field)			54.4	53.9	55.6	57.5	55.8	53.2		61.8
-R _{ew}	EW02 - Timber Frame Cladding		-15	-27	-37	-44	-46	-52		
+10logS	(S=element area)		8.2705	8.2705	8.2705	8.2705	8.2705	8.2705		
-10logA	(A=0.161V/T)		-17.48	-17.48	-17.48	-17.48	-17.48	-17.48		
=L2 Day			25.7	12.5	2.2	-3.2	-6.6	-18.6		11.4
=L2 Night			18.9	6.7	-4.3	-10.5	-17.9	-22.4		5.6
=L2 Night Max			33.2	20.7	12.4	7.3	3.6	-5.0		19.2

Element 2 Windows										
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
L1 Night (free-field)			40.1	39.9	38.9	39.7	34.3	35.8		43.5
L1 Night Max (free-field)			54.4	53.9	55.6	57.5	55.8	53.2		61.8
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31		
+10logS	(S=element area)		0	0	0	0	0	0		
-10logA	(A=0.161V/T)		-17.48	-17.48	-17.48	-17.48	-17.48	-17.48		
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night Max			0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 3 Door										
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
L1 Night (free-field)			40.1	39.9	38.9	39.7	34.3	35.8		43.5
L1 Night Max (free-field)			54.4	53.9	55.6	57.5	55.8	53.2		61.8
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32		
+10logS	(S=element area)		3.8382	3.8382	3.8382	3.8382	3.8382	3.8382		
-10logA	(A=0.161V/T)		-17.48	-17.48	-17.48	-17.48	-17.48	-17.48		
=L2 Day			16.3	10.1	7.8	8.4	3.0	-3.0		12.0
=L2 Night			9.5	4.3	1.3	1.1	-8.3	-6.8		5.6
=L2 Night Max			23.8	18.3	18.0	18.9	13.2	10.6		22.0

Element 4 Ventilator										
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
L1 Night (free-field)			40.1	39.9	38.9	39.7	34.3	35.8		43.5
L1 Night Max (free-field)			54.4	53.9	55.6	57.5	55.8	53.2		61.8
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)		-32.4	-33	-31	-27.2	-29.8	-32.7		
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10		
-10logA	(A=0.161V/T)		-17.48	-17.48	-17.48	-17.48	-17.48	-17.48		
=L2 Day			10.0	8.2	9.9	15.3	11.3	2.4		17.8
=L2 Night			3.2	2.4	3.4	8.0	0.0	-1.4		10.2
=L2 Night Max			17.5	16.4	20.1	25.8	21.5	16.0		28.3

Element 5 Roof										
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
L1 Night (free-field)			40.1	39.9	38.9	39.7	34.3	35.8		43.5
L1 Night Max (free-field)			54.4	53.9	55.6	57.5	55.8	53.2		61.8
-R _{rr}	Tiled roof, 12.5mm wall board ceiling		-21	-37	-46	-52	-52	-50		
+10logS	(S=element area)		9.1724	9.1724	9.1724	9.1724	9.1724	9.1724		
-10logA	(A=0.161V/T)		-17.48	-17.48	-17.48	-17.48	-17.48	-17.48		
=L2 Day			20.6	3.4	-5.9	-10.3	-11.7	-15.7		6.2
=L2 Night			13.8	-2.4	-12.4	-17.6	-23.0	-19.5		1.8
=L2 Night Max			28.1	11.6	4.3	0.2	-1.5	-2.1		13.5

Total of All Elements										
=L2 Day			27.3	15.8	12.7	16.3	12.3	5.2		19.8
=L2 Night			20.5	10.3	7	9.4	3.4	2.9		13.2
=L2 Night Max			34.8	23.9	22.7	26.7	22.2	17.3		29.7

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	3-0-E-LDK
Façade facing	East

RESULT SUMMARY - Day

Predicted internal level	24 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-11 dB	LAeq,T

ROOM DIMENSIONS

External wall length	5.1 m
External wall height	2.9 m
External roof length	5.1 m
External roof height	2.2 m
Room height	4.0 m
Floor/ceiling area	24.2 m ²
External window area S_{wi}	- m ²
External door area S_{do}	- m ²
External wall area S_{ew}	14.8 m ²
External roof area S_{rr}	11.2 m ²
Total façade area S_f	26.0 m ²
Total area of elements S	26.0 m ²
Room volume V	96.8 m ³

GLOBAL PROPERTIES

External noise level	Façade	Façade correction	-3 dB
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Reverberation time, sec

A-weighting values, dB

Daytime External noise level Leq, dB

Corrected daytime external noise level (L1) Leq, dB(A)

Octave band centre frequency, Hz								Broadband, dB(A)
63	125	250	500	1000	2000	4000	8000	
	0.5	0.5	0.5	0.5	0.5	0.5		
-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1	
	49.9	48.7	48.4	50	48.6	42.6		54.1
	46.9	45.7	45.4	47	45.6	39.6	0	51.1

ELEMENT SELECTION

Element	Type	Description	R_w	R_w+C_{tr}	$D_{n,e}+C_{tr}$
1	Wall	EW02 - Timber Frame Cladding	38	29	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door	-	-	-
4	Ventilator	Vent ($D_{n,e}$ 27 dB, $D_{n,e}+C_{tr}$ 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)
		63	125	250	500	1000	2000	4000	
Element 1 Wall									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{ew}	EW02 - Timber Frame Cladding		-15	-27	-37	-44	-46	-52	
+10logS	(S=element area)		11.7	11.7	11.7	11.7	11.7	11.7	
-10logA	(A=0.161V/T)		-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	
=L2 Day			31.7	18.5	8.2	2.8	-0.6	-12.6	17.2
Element 2 Windows									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31	
+10logS	(S=element area)		0	0	0	0	0	0	
-10logA	(A=0.161V/T)		-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0	0.0
Element 3 Door									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32	
+10logS	(S=element area)		0	0	0	0	0	0	
-10logA	(A=0.161V/T)		-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0	0.0
Element 4 Ventilator									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)		-33.4	-26.6	-27.1	-28.4	-25.5	-27	
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10	
-10logA	(A=0.161V/T)		-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	
=L2 Day			11.6	17.2	16.4	16.7	18.2	10.7	22.4
Element 5 Roof									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{rr}			-21	-37	-46	-52	-52	-50	
+10logS	(S=element area)		10.5	10.5	10.5	10.5	10.5	10.5	
-10logA	(A=0.161V/T)		-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	
=L2 Day			24.5	7.3	-2.0	-6.4	-7.8	-11.8	9.6
Total of All Elements									
=L2 Day			32.5	21.1	17.2	17	18.4	11.4	23.8

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	3-0-W-LDK
Façade facing	West

RESULT SUMMARY - Day

Predicted internal level	27 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-8 dB	LAeq,T

ROOM DIMENSIONS

External wall length	5.1 m
External wall height	2.9 m
External roof length	5.1 m
External roof height	2.2 m
Room height	4.0 m
Floor/ceiling area	24.2 m ²
External window area S_{wi}	2.8 m ²
External door area S_{do}	2.8 m ²
External wall area S_{ew}	9.3 m ²
External roof area S_{rr}	11.2 m ²
Total façade area S_f	26.0 m ²
Total area of elements S	26.0 m ²
Room volume V	96.8 m ³

GLOBAL PROPERTIES

External noise level	Free-field	Façade correction	0 dB
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Reverberation time, sec

A-weighting values, dB

Daytime External noise level Leq, dB

Corrected daytime external noise level (L1) Leq, dB(A)

Octave band centre frequency, Hz								Broadband, dB(A)
63	125	250	500	1000	2000	4000	8000	
	0.5	0.5	0.5	0.5	0.5	0.5		
-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1	
	49.9	48.7	48.4	50	48.6	42.6		54.1
	49.9	48.7	48.4	50	48.6	42.6	0	54.1

ELEMENT SELECTION

Element	Type	Description	R_w	R_w+C_{tr}	$D_{n,e}+C_{tr}$
1	Wall	EW01 - Masonry	53	46	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door	-	-	-
4	Ventilator	Vent ($D_{n,e}$ 27 dB, $D_{n,e}+C_{tr}$ 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)	
		63	125	250	500	1000	2000	4000		8000
Element 1	Wall									
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
-R _{ew}	EW01 - Masonry		-32	-41	-52	-57	-67	-66		
+10logS	(S=element area)		9.6802	9.6802	9.6802	9.6802	9.6802	9.6802		
-10logA	(A=0.161V/T)		-14.94	-14.94	-14.94	-14.94	-14.94	-14.94		
=L2 Day			15.6	5.4	-5.9	-9.3	-20.7	-25.7		3.8

Element 2	Windows								
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6	54.1
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31	
+10logS	(S=element area)		4.3933	4.3933	4.3933	4.3933	4.3933	4.3933	
-10logA	(A=0.161V/T)		-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	
=L2 Day			21.4	24.2	15.9	7.5	4.1	4.1	18.3

Element 3	Door								
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6	54.1
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32	
+10logS	(S=element area)		4.3933	4.3933	4.3933	4.3933	4.3933	4.3933	
-10logA	(A=0.161V/T)		-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	
=L2 Day			22.4	16.2	13.9	14.5	9.1	3.1	17.9

Element 4	Ventilator								
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6	54.1
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)		-33.4	-26.6	-27.1	-28.4	-25.5	-27	
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10	
-10logA	(A=0.161V/T)		-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	
=L2 Day			14.6	20.2	19.4	19.7	21.2	13.7	25.4

Element 5	Roof								
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6	54.1
-R _{rr}			-21	-37	-46	-52	-52	-50	
+10logS	(S=element area)		10.5	10.5	10.5	10.5	10.5	10.5	
-10logA	(A=0.161V/T)		-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	
=L2 Day			27.5	10.3	1.0	-3.4	-4.8	-8.8	12.4

Total of All Elements									
=L2 Day			29.7	26.2	21.8	21	21.5	14.5	26.9

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	3-0-W-B1
Façade facing	West

RESULT SUMMARY - Day

Predicted internal level	29 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-6 dB	LAeq,T

RESULT SUMMARY - Night

Predicted internal level	22 dB	LAeq,T	40 dB	LAMax,T
Internal level criterion	30 dB	LAeq,T	45 dB	LAMax,T
Difference	-8 dB	LAeq,T	-5 dB	LAMax,T

ROOM DIMENSIONS

External wall length	2.9 m
External wall height	2.9 m
External roof length	2.9 m
External roof height	2.2 m
Room height	4.0 m
Floor/ceiling area	8.2 m ²
External window area S _{wi}	2.8 m ²
External door area S _{do}	- m ²
External wall area S _{ew}	5.5 m ²
External roof area S _{rr}	6.3 m ²
Total façade area S _f	14.5 m ²
Total area of elements S	14.5 m ²
Room volume V	32.8 m ³

GLOBAL PROPERTIES

External noise level	Freefield	Façade correction	0 dB
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	Octave band centre frequency, Hz								Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000	
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5		
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1	
Daytime External noise level Leq, dB		49.9	48.7	48.4	50	48.6	42.6		54.1
Corrected daytime external noise level (L1) Leq, dB(A)	0	49.9	48.7	48.4	50	48.6	42.6	0	54.1
Night-time External noise level Leq, dB		43.1	42.9	41.9	42.7	37.3	38.8		46.5
Corrected night-time external noise level (L1) Leq, dB	0	43.1	42.9	41.9	42.7	37.3	38.8	0	46.5
Night-time External noise level Lmax, dB		57.4	56.9	58.6	60.5	58.8	56.2		64.8
Corrected night-time external noise level (L1) Lmax, dB	0	57.4	56.9	58.6	60.5	58.8	56.2	0	64.8

ELEMENT SELECTION

Element	Type	Description	R _w	R _w +C _{tr}	D _{n,e} +C _{tr}
1	Wall	EW01 - Masonry	53	46	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door			-
4	Ventilator	Vent (D _{n,e} 27 dB, D _{n,e} +C _{tr} 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)	
		63	125	250	500	1000	2000	4000		8000
Element 1	Wall									
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
L1 Night (free-field)			43.1	42.9	41.9	42.7	37.3	38.8		46.5
L1 Night Max (free-field)			57.4	56.9	58.6	60.5	58.8	56.2		64.8
-R _{ew}	EW01 - Masonry		-32	-41	-52	-57	-67	-66		
+10logS	(S=element area)		7.4155	7.4155	7.4155	7.4155	7.4155	7.4155		
-10logA	(A=0.161V/T)		-10.24	-10.24	-10.24	-10.24	-10.24	-10.24		
=L2 Day			18.1	7.9	-3.4	-6.8	-18.2	-23.2		
=L2 Night			11.3	2.1	-9.9	-14.1	-29.5	-27.0		1.5
=L2 Night Max			25.6	16.1	6.8	3.7	-8.0	-9.6		13.0

Element 2 Windows										
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
L1 Night (free-field)			43.1	42.9	41.9	42.7	37.3	38.8		46.5
L1 Night Max (free-field)			57.4	56.9	58.6	60.5	58.8	56.2		64.8
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31		
+10logS	(S=element area)		4.3933	4.3933	4.3933	4.3933	4.3933	4.3933		
-10logA	(A=0.161V/T)		-10.24	-10.24	-10.24	-10.24	-10.24	-10.24		
=L2 Day			26.1	28.9	20.6	12.2	8.8	8.8		23.0
=L2 Night			19.3	23.1	14.1	4.9	-2.5	5.0		16.9
=L2 Night Max			33.6	37.1	30.8	22.7	19.0	22.4		32.4

Element 3 Door										
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
L1 Night (free-field)			43.1	42.9	41.9	42.7	37.3	38.8		46.5
L1 Night Max (free-field)			57.4	56.9	58.6	60.5	58.8	56.2		64.8
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32		
+10logS	(S=element area)		0	0	0	0	0	0		
-10logA	(A=0.161V/T)		-10.24	-10.24	-10.24	-10.24	-10.24	-10.24		
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night Max			0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 4 Ventilator										
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
L1 Night (free-field)			43.1	42.9	41.9	42.7	37.3	38.8		46.5
L1 Night Max (free-field)			57.4	56.9	58.6	60.5	58.8	56.2		64.8
-D _{n,e}	Vent (D _{n,e} 27 dB, D _{n,e} +Ctr 27 dB)		-32.4	-33	-31	-27.2	-29.8	-32.7		
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10		
-10logA	(A=0.161V/T)		-10.24	-10.24	-10.24	-10.24	-10.24	-10.24		
=L2 Day			20.3	18.5	20.2	25.6	21.6	12.7		28.0
=L2 Night			13.5	12.7	13.7	18.3	10.3	8.9		20.2
=L2 Night Max			27.8	26.7	30.4	36.1	31.8	26.3		38.5

Element 5 Roof										
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
L1 Night (free-field)			43.1	42.9	41.9	42.7	37.3	38.8		46.5
L1 Night Max (free-field)			57.4	56.9	58.6	60.5	58.8	56.2		64.8
-R _{rr}	Tiled roof, 12.5mm wall board ceiling		-21	-37	-46	-52	-52	-50		
+10logS	(S=element area)		7.9727	7.9727	7.9727	7.9727	7.9727	7.9727		
-10logA	(A=0.161V/T)		-10.24	-10.24	-10.24	-10.24	-10.24	-10.24		
=L2 Day			29.6	12.4	3.1	-1.3	-2.7	-6.7		14.5
=L2 Night			22.8	6.6	-3.4	-8.6	-14.0	-10.5		8.2
=L2 Night Max			37.1	20.6	13.3	9.2	7.5	6.9		22.4

Total of All Elements										
=L2 Day			31.7	29.4	23.4	25.8	21.8	14.3		29.3
=L2 Night			25	23.6	17	18.5	10.9	10.8		22.1
=L2 Night Max			39.2	37.6	33.6	36.3	32	27.8		39.6

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	4-0-E-LDK
Façade facing	East

RESULT SUMMARY - Day

Predicted internal level	24 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-11 dB	LAeq,T

ROOM DIMENSIONS

External wall length	5.1 m
External wall height	2.9 m
External roof length	5.1 m
External roof height	2.2 m
Room height	4.0 m
Floor/ceiling area	28.0 m ²
External window area	S_{wi} 2.4 m ²
External door area	S_{do} - m ²
External wall area	S_{ew} 12.4 m ²
External roof area	S_{rr} 11.2 m ²
Total façade area	S_f 26.0 m ²
Total area of elements	S 26.0 m ²
Room volume	V 112.0 m ³

GLOBAL PROPERTIES

External noise level	Façade	Façade correction	-3 dB
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	Octave band centre frequency, Hz							Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5	
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1
Daytime External noise level Leq, dB		49.9	48.7	48.4	50	48.6	42.6	54.1
Corrected daytime external noise level (L1) Leq, dB(A)		46.9	45.7	45.4	47	45.6	39.6	51.1

ELEMENT SELECTION

Element	Type	Description	R_w	R_w+C_{tr}	$D_{n,e}+C_{tr}$
1	Wall	EW02 - Timber Frame Cladding	38	29	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door	-	-	-
4	Ventilator	Vent ($D_{n,e}$ 27 dB, $D_{n,e}+C_{tr}$ 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)
		63	125	250	500	1000	2000	4000	
Element 1 Wall									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{ew}	EW02 - Timber Frame Cladding		-15	-27	-37	-44	-46	-52	
+10logS	(S=element area)		10.931	10.931	10.931	10.931	10.931	10.931	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			30.3	17.1	6.8	1.4	-2.0	-14.0	15.8
Element 2 Windows									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31	
+10logS	(S=element area)		3.8021	3.8021	3.8021	3.8021	3.8021	3.8021	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			17.1	19.9	11.6	3.2	-0.2	-0.2	14.2
Element 3 Door									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32	
+10logS	(S=element area)		0	0	0	0	0	0	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0	0.0
Element 4 Ventilator									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)		-33.4	-26.6	-27.1	-28.4	-25.5	-27	
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			10.9	16.5	15.7	16.0	17.5	10.0	21.8
Element 5 Roof									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{rr}			-21	-37	-46	-52	-52	-50	
+10logS	(S=element area)		10.5	10.5	10.5	10.5	10.5	10.5	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			23.8	6.6	-2.7	-7.1	-8.5	-12.5	9.0
Total of All Elements									
=L2 Day			31.4	23	17.7	16.5	17.7	10.8	23.5

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	4-0-S-LDK
Façade facing	South

RESULT SUMMARY - Day

Predicted internal level	22 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-13 dB	LAeq,T

ROOM DIMENSIONS

External wall length	5.1 m
External wall height	2.9 m
External roof length	5.1 m
External roof height	2.2 m
Room height	4.0 m
Floor/ceiling area	28.0 m ²
External window area	S_{wi} - m ²
External door area	S_{do} - m ²
External wall area	S_{ew} 14.8 m ²
External roof area	S_{rr} 11.2 m ²
Total façade area	S_f 26.0 m ²
Total area of elements	S 26.0 m ²
Room volume	V 112.0 m ³

GLOBAL PROPERTIES

External noise level	Façade	Façade correction	-3 dB
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Reverberation time, sec

A-weighting values, dB

Daytime External noise level Leq, dB

Corrected daytime external noise level (L1) Leq, dB(A)

Octave band centre frequency, Hz								Broadband, dB(A)
63	125	250	500	1000	2000	4000	8000	
	0.5	0.5	0.5	0.5	0.5	0.5		
-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1	
	49.9	48.7	48.4	50	48.6	42.6		54.1
	46.9	45.7	45.4	47	45.6	39.6	0	51.1

ELEMENT SELECTION

Element	Type	Description	R_w	R_w+C_{tr}	$D_{n,e}+C_{tr}$
1	Wall	EW01 - Masonry	53	46	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door	-	-	-
4	Ventilator	Vent ($D_{n,e}$ 27 dB, $D_{n,e}+C_{tr}$ 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)	
		63	125	250	500	1000	2000	4000		8000
Element 1	Wall									
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6		51.1
-R _{ew}	EW01 - Masonry		-32	-41	-52	-57	-67	-66		
+10logS	(S=element area)		11.7	11.7	11.7	11.7	11.7	11.7		
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57		
=L2 Day			14.0	3.8	-7.5	-10.9	-22.3	-27.3		2.8

Element 2	Windows								
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31	
+10logS	(S=element area)		0	0	0	0	0	0	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0	0.0

Element 3	Door								
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32	
+10logS	(S=element area)		0	0	0	0	0	0	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0	0.0

Element 4	Ventilator								
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)		-33.4	-26.6	-27.1	-28.4	-25.5	-27	
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			10.9	16.5	15.7	16.0	17.5	10.0	21.8

Element 5	Roof								
L1 Day (free-field)			46.9	45.7	45.4	47	45.6	39.6	51.1
-R _{rr}			-21	-37	-46	-52	-52	-50	
+10logS	(S=element area)		10.5	10.5	10.5	10.5	10.5	10.5	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			23.8	6.6	-2.7	-7.1	-8.5	-12.5	9.0

Total of All Elements									
=L2 Day			24.5	17.3	16	16.3	17.7	10.8	22.2

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	4-0-W-LDK
Façade facing	West

RESULT SUMMARY - Day

Predicted internal level	26 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-9 dB	LAeq,T

ROOM DIMENSIONS

External wall length	5.1 m
External wall height	2.9 m
External roof length	5.1 m
External roof height	2.2 m
Room height	4.0 m
Floor/ceiling area	28.0 m ²
External window area S_{wi}	2.8 m ²
External door area S_{do}	2.8 m ²
External wall area S_{ew}	9.3 m ²
External roof area S_{rr}	11.2 m ²
Total façade area S_f	26.0 m ²
Total area of elements S	26.0 m ²
Room volume V	112.0 m ³

GLOBAL PROPERTIES

External noise level	Free-field	Façade correction	0 dB
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Reverberation time, sec

A-weighting values, dB

Daytime External noise level Leq, dB

Corrected daytime external noise level (L1) Leq, dB(A)

Octave band centre frequency, Hz								Broadband, dB(A)
63	125	250	500	1000	2000	4000	8000	
	0.5	0.5	0.5	0.5	0.5	0.5		
-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1	
	49.9	48.7	48.4	50	48.6	42.6		54.1
	49.9	48.7	48.4	50	48.6	42.6	0	54.1

ELEMENT SELECTION

Element	Type	Description	R_w	R_w+C_{tr}	$D_{n,e}+C_{tr}$
1	Wall	EW01 - Masonry	53	46	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door	-	-	-
4	Ventilator	Vent ($D_{n,e}$ 27 dB, $D_{n,e}+C_{tr}$ 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)	
		63	125	250	500	1000	2000	4000		8000
Element 1	Wall									
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
-R _{ew}	EW01 - Masonry		-32	-41	-52	-57	-67	-66		
+10logS	(S=element area)		9.6802	9.6802	9.6802	9.6802	9.6802	9.6802		
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57		
=L2 Day			15.0	4.8	-6.5	-9.9	-21.3	-26.3		3.4

Element 2	Windows								
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6	54.1
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31	
+10logS	(S=element area)		4.3933	4.3933	4.3933	4.3933	4.3933	4.3933	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			20.7	23.5	15.2	6.8	3.4	3.4	17.7

Element 3	Door								
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6	54.1
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32	
+10logS	(S=element area)		4.3933	4.3933	4.3933	4.3933	4.3933	4.3933	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			21.7	15.5	13.2	13.8	8.4	2.4	17.3

Element 4	Ventilator								
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6	54.1
-D _{n,e}	Vent (Dn,e 27 dB, Dn,e+Ctr 27 dB)		-33.4	-26.6	-27.1	-28.4	-25.5	-27	
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			13.9	19.5	18.7	19.0	20.5	13.0	24.7

Element 5	Roof								
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6	54.1
-R _{rr}			-21	-37	-46	-52	-52	-50	
+10logS	(S=element area)		10.5	10.5	10.5	10.5	10.5	10.5	
-10logA	(A=0.161V/T)		-15.57	-15.57	-15.57	-15.57	-15.57	-15.57	
=L2 Day			26.8	9.6	0.3	-4.1	-5.5	-9.5	11.8

Total of All Elements									
=L2 Day			29.1	25.6	21.1	20.4	20.9	13.8	26.3

BS 8233:2014 G.2 Typical design problem: More rigorous calculation

ROOM DETAILS

Property address	Knights Place Farm, Cobham, North Rochester
Room type/ID	4-0-W-B1
Façade facing	West

RESULT SUMMARY - Day

Predicted internal level	29 dB	LAeq,T
Internal level criterion	35 dB	LAeq,T
Difference	-6 dB	LAeq,T

RESULT SUMMARY - Night

Predicted internal level	22 dB	LAeq,T	40 dB	LAMax,T
Internal level criterion	30 dB	LAeq,T	45 dB	LAMax,T
Difference	-8 dB	LAeq,T	-5 dB	LAMax,T

ROOM DIMENSIONS

External wall length	2.9 m
External wall height	2.9 m
External roof length	2.9 m
External roof height	2.2 m
Room height	4.0 m
Floor/ceiling area	8.2 m ²
External window area S _{wi}	2.8 m ²
External door area S _{do}	- m ²
External wall area S _{ew}	5.5 m ²
External roof area S _{rr}	6.3 m ²
Total façade area S _f	14.5 m ²
Total area of elements S	14.5 m ²
Room volume V	32.8 m ³

GLOBAL PROPERTIES

External noise level	Freefield	Façade correction	0 dB
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	Octave band centre frequency, Hz								Broadband, dB(A)
	63	125	250	500	1000	2000	4000	8000	
Reverberation time, sec		0.5	0.5	0.5	0.5	0.5	0.5		
A-weighting values, dB	-26.2	-16.1	-8.6	-3.9	0	1.2	1	-1.1	
Daytime External noise level Leq, dB		49.9	48.7	48.4	50	48.6	42.6		54.1
Corrected daytime external noise level (L1) Leq, dB(A)	0	49.9	48.7	48.4	50	48.6	42.6	0	54.1
Night-time External noise level Leq, dB		43.1	42.9	41.9	42.7	37.3	38.8		46.5
Corrected night-time external noise level (L1) Leq, dB	0	43.1	42.9	41.9	42.7	37.3	38.8	0	46.5
Night-time External noise level Lmax, dB		57.4	56.9	58.6	60.5	58.8	56.2		64.8
Corrected night-time external noise level (L1) Lmax, dB	0	57.4	56.9	58.6	60.5	58.8	56.2	0	64.8

ELEMENT SELECTION

Element	Type	Description	R _w	R _w +C _{tr}	D _{n,e} +C _{tr}
1	Wall	EW01 - Masonry	53	46	-
2	Windows	4-(6-16)-4	29	25	-
3	Door	25kg/m2 well sealed door			-
4	Ventilator	Vent (D _{n,e} 27 dB, D _{n,e} +C _{tr} 27 dB)	-	-	27
5	Roof	Tiled roof, 12.5mm wall board ceiling	46	35	-

DETAILED SOUND INSULATION BY ELEMENT CALCULATION

		Octave band centre frequency, Hz							Broadband, dB(A)	
		63	125	250	500	1000	2000	4000		8000
Element 1	Wall									
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
L1 Night (free-field)			43.1	42.9	41.9	42.7	37.3	38.8		46.5
L1 Night Max (free-field)			57.4	56.9	58.6	60.5	58.8	56.2		64.8
-R _{ew}	EW01 - Masonry		-32	-41	-52	-57	-67	-66		
+10logS	(S=element area)		7.4155	7.4155	7.4155	7.4155	7.4155	7.4155		
-10logA	(A=0.161V/T)		-10.24	-10.24	-10.24	-10.24	-10.24	-10.24		
=L2 Day			18.1	7.9	-3.4	-6.8	-18.2	-23.2		
=L2 Night			11.3	2.1	-9.9	-14.1	-29.5	-27.0		1.5
=L2 Night Max			25.6	16.1	6.8	3.7	-8.0	-9.6		13.0

Element 2 Windows										
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
L1 Night (free-field)			43.1	42.9	41.9	42.7	37.3	38.8		46.5
L1 Night Max (free-field)			57.4	56.9	58.6	60.5	58.8	56.2		64.8
-R _{ew}	4-(6-16)-4		-21	-17	-25	-35	-37	-31		
+10logS	(S=element area)		4.3933	4.3933	4.3933	4.3933	4.3933	4.3933		
-10logA	(A=0.161V/T)		-10.24	-10.24	-10.24	-10.24	-10.24	-10.24		
=L2 Day			26.1	28.9	20.6	12.2	8.8	8.8		23.0
=L2 Night			19.3	23.1	14.1	4.9	-2.5	5.0		16.9
=L2 Night Max			33.6	37.1	30.8	22.7	19.0	22.4		32.4

Element 3 Door										
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
L1 Night (free-field)			43.1	42.9	41.9	42.7	37.3	38.8		46.5
L1 Night Max (free-field)			57.4	56.9	58.6	60.5	58.8	56.2		64.8
-R _{do}	25kg/m2 well sealed door		-20	-25	-27	-28	-32	-32		
+10logS	(S=element area)		0	0	0	0	0	0		
-10logA	(A=0.161V/T)		-10.24	-10.24	-10.24	-10.24	-10.24	-10.24		
=L2 Day			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night			0.0	0.0	0.0	0.0	0.0	0.0		0.0
=L2 Night Max			0.0	0.0	0.0	0.0	0.0	0.0		0.0

Element 4 Ventilator										
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
L1 Night (free-field)			43.1	42.9	41.9	42.7	37.3	38.8		46.5
L1 Night Max (free-field)			57.4	56.9	58.6	60.5	58.8	56.2		64.8
-D _{n,e}	Vent (D _{n,e} 27 dB, D _{n,e} +Ctr 27 dB)		-32.4	-33	-31	-27.2	-29.8	-32.7		
+10logS ₀	(S ₀ =reference area)		10	10	10	10	10	10		
-10logA	(A=0.161V/T)		-10.24	-10.24	-10.24	-10.24	-10.24	-10.24		
=L2 Day			20.3	18.5	20.2	25.6	21.6	12.7		28.0
=L2 Night			13.5	12.7	13.7	18.3	10.3	8.9		20.2
=L2 Night Max			27.8	26.7	30.4	36.1	31.8	26.3		38.5

Element 5 Roof										
L1 Day (free-field)			49.9	48.7	48.4	50	48.6	42.6		54.1
L1 Night (free-field)			43.1	42.9	41.9	42.7	37.3	38.8		46.5
L1 Night Max (free-field)			57.4	56.9	58.6	60.5	58.8	56.2		64.8
-R _{rr}	Tiled roof, 12.5mm wall board ceiling		-21	-37	-46	-52	-52	-50		
+10logS	(S=element area)		7.9727	7.9727	7.9727	7.9727	7.9727	7.9727		
-10logA	(A=0.161V/T)		-10.24	-10.24	-10.24	-10.24	-10.24	-10.24		
=L2 Day			29.6	12.4	3.1	-1.3	-2.7	-6.7		14.5
=L2 Night			22.8	6.6	-3.4	-8.6	-14.0	-10.5		8.2
=L2 Night Max			37.1	20.6	13.3	9.2	7.5	6.9		22.4

Total of All Elements										
=L2 Day			31.7	29.4	23.4	25.8	21.8	14.3		29.3
=L2 Night			25	23.6	17	18.5	10.9	10.8		22.1
=L2 Night Max			39.2	37.6	33.6	36.3	32	27.8		39.6

Appendix E

BS 8233 Detailed Noise Assessment Summary – Closed Windows

Unit	Floor	Room Code	Room	Façade facing	Internal Criteria, dB			Internal Noise Level, dB			Combined Internal Noise Level,			Criteria Achieved?		
					Day LAeq	Night LAeq	Night LAmax	Day LAeq	Night LAeq	Night LAmax	Day LAeq	Night LAeq	Night LAmax	Day LAeq	Night LAeq	Night LAmax
1	0	LD	Living/Dining	N	35			27			31			Yes		
1	0	LD	Living/Dining	E	35			20								
1	0	LD	Living/Dining	S	35			23								
1	0	LD	Living/Dining	W	35			27								
1	1	B1	Bedroom 1	E	35	30	45	28	20	38	28	20	38	Yes	Yes	Yes
1	1	B2	Bedroom 2	W	35	30	45	31	29	39	31	29	39	Yes	Yes	Yes
2	0	LKB	Living/Kitchen/Bedroom	N	35	30	45	25	23	32	26	23	32	Yes	Yes	Yes
2	0	LKB	Living/Kitchen/Bedroom	S	35	30	45	20	13	30						
3	0	LDK	Living/Dining/Kitchen	E	35			24			29			Yes		
3	0	LDK	Living/Dining/Kitchen	W	35			27								
3	0	B1	Bedroom 1	W	35	30	45	29	22	40	29	22	40	Yes	Yes	Yes
4	0	LDK	Living/Dining/Kitchen	E	35			24			29			Yes		
4	0	LDK	Living/Dining/Kitchen	S	35			22								
4	0	LDK	Living/Dining/Kitchen	W	35			26								
4	0	B1	Bedroom 1	W	35	30	45	29	22	40	29	22	40	Yes	Yes	Yes

Appendix F

Horse Activity Noise Assessment

Measured Horse Activity $L_{A\text{Max}}$ Noise Levels

Date	Start Time	$L_{A\text{Max},10\text{sec}}$ dB	Octave Band $L_{\text{Max},10\text{sec}}$ dB						
			63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
25/05/2022	11:16:40	39.4	45.4	38.4	34.4	35.1	34.8	31.4	30.8
25/05/2022	11:55:30	41.0	43.6	37.9	36.0	37.0	35.4	35.3	31.1
25/05/2022	11:23:10	41.4	45.2	41.7	39.0	36.5	37.8	34.9	27.2
25/05/2022	11:16:50	41.8	45.1	42.1	39.9	37.8	37.3	34.8	30.5
25/05/2022	11:23:20	42.5	51.3	42.5	38.5	36.5	39.3	35.7	28.0
25/05/2022	11:33:30	42.5	43.1	42.2	39.9	39.6	38.2	35.4	30.1
25/05/2022	11:39:50	44.1	46.9	48.9	46.3	43.6	37.8	28.0	22.6
25/05/2022	11:25:40	44.3	45.0	37.4	35.5	35.4	38.1	40.3	35.6
25/05/2022	11:35:00	44.7	50.5	44.0	38.6	41.5	39.3	36.6	38.0
25/05/2022	11:21:00	45.6	45.2	47.6	49.8	45.0	35.9	27.5	23.9
25/05/2022	11:17:20	46.0	64.8	49.7	42.2	42.3	41.6	32.9	29.8
25/05/2022	11:26:10	47.0	50.1	57.3	50.2	42.4	41.4	35.7	28.6
25/05/2022	11:29:30	48.7	50.8	48.9	45.5	46.4	45.1	39.8	33.2
25/05/2022	11:35:10	48.7	50.0	52.0	45.5	41.0	44.8	43.1	39.5
25/05/2022	11:53:30	48.9	45.1	49.1	50.6	49.1	42.5	27.0	24.1
25/05/2022	11:11:30	50.2	53.7	54.4	58.0	45.4	40.3	32.0	26.6
25/05/2022	11:32:30	50.7	45.0	48.9	51.9	50.7	45.2	32.2	28.1
25/05/2022	11:46:20	50.7	44.9	42.3	41.6	54.3	37.4	29.7	20.9
25/05/2022	10:57:10	50.9	47.8	45.9	41.0	38.3	42.1	47.8	41.8
25/05/2022	11:31:10	51.0	49.1	52.7	54.1	51.1	42.3	32.9	27.6
25/05/2022	10:53:50	51.3	40.3	36.2	34.6	34.1	33.8	29.9	49.1
25/05/2022	11:51:00	51.6	46.7	48.1	49.2	43.8	43.6	48.5	37.6
25/05/2022	11:20:20	52.0	49.5	47.1	43.5	47.7	47.8	46.8	32.0
25/05/2022	11:49:10	52.2	52.9	56.9	56.3	52.2	40.9	33.3	27.4
25/05/2022	11:48:40	52.5	50.6	63.6	55.6	44.5	45.3	44.5	39.6
25/05/2022	11:58:50	52.5	45.9	55.5	55.2	52.9	43.6	31.3	26.2
25/05/2022	11:40:00	53.2	56.2	59.4	57.4	53.5	39.2	29.0	21.2
25/05/2022	11:38:00	53.3	48.6	38.6	40.1	43.4	43.6	49.5	46.7
25/05/2022	11:35:40	54.5	48.1	46.4	45.7	48.4	52.9	44.0	39.1
25/05/2022	11:35:50	54.5	54.4	57.3	59.7	53.5	40.8	35.0	31.5
25/05/2022	11:34:30	55.0	48.9	52.3	54.6	54.3	51.3	40.2	25.4
25/05/2022	11:50:20	55.4	53.5	58.6	56.5	55.6	49.9	37.3	24.1
25/05/2022	11:37:00	57.8	60.1	68.0	62.6	55.0	44.0	37.9	34.1
25/05/2022	11:46:40	60.1	54.1	59.5	56.1	57.2	57.6	49.9	33.8
25/05/2022	11:23:30	60.2	55.4	62.2	61.5	59.4	55.5	46.8	31.7
25/05/2022	11:59:10	63.1	58.3	66.1	63.0	61.8	59.4	47.9	32.6
25/05/2022	11:26:30	63.5	58.2	64.8	63.6	63.7	58.9	45.2	31.1
25/05/2022	11:47:00	64.1	58.0	64.8	64.7	63.8	59.4	52.5	36.9
25/05/2022	11:26:00	71.9	65.9	72.3	69.4	70.3	68.7	61.5	45.9

Average Horse Activity L_{Amax} Octave Band Spectra

	Octave Band $L_{Max,10sec}$ dB						
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Z-weighted average spectra for Horse Activity L_{Amax}	55.2	60.4	58.0	57.3	54.8	47.6	37.9
A-weighted average spectra for Horse Activity L_{Amax}	29.0	44.3	49.4	53.4	54.8	48.8	38.9
Normalised A-weighted spectra for Horse Activity L_{Amax}	-29.6	-14.3	-9.2	-5.2	-3.8	-9.8	-19.7
A-weighted spectra for $L_{Amax} = 60$ dB	30.4	45.7	50.8	54.8	56.2	50.2	40.3
Z-weighted spectra for $L_{Amax} = 60$ dB	56.6	61.8	59.4	58.7	56.2	49.0	39.3

Sound Reduction Index of Wall Constructions

Construction	Sound Reduction Index $R_w + C_{tr}$ dB	Octave Band Sound Reduction Index - R_w , dB						
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Existing wall Plywood 15 mm/110 mm timber stud/15mm plywood	22	16	8	21	35	36	26	44
Proposed Wall 140mm aerated concrete block + independent wall w / 12.5mm wall board	39	16	25	34	47	54	62	62
Sound reduction improvement	17	0	17	13	12	18	36	18

Internal Horse Activity L_{Amax} with Proposed Wall

	$L_{Max,10sec}$ dB	Octave Band $L_{Max,10sec}$ dB						
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Z-weighted spectra for Horse Activity L_{Amax} with upgraded partition	57.7	56.6	44.8	46.4	46.7	38.2	13	21.3
A-weighted spectra for Horse Activity L_{Amax} with upgraded partition	45.3	30.4	28.7	37.8	42.8	38.2	14.2	22.3