



Project: J 03665R1
Acoustic Assessment:
2 North Street, Caversham

Consultants: Sound Planning Ltd
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GU10 3QS

Client: Christopher James Architecture

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Signed: 

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1.0 BACKGROUND

1.1 Proposal:

To demolish existing single storey detached building (formerly used as an ancillary building for 23 Prospect Street) and erect 2 new residential dwellings.

See APPENDIX 2 - Site Location/Plans

1.2 Local Environment

1.2.1 Front Elevation

To the front of the building (North Street) is a relatively quiet street (little road traffic as a no through road) which is screened from Prospect Street and the mechanical plant associated with rear elevations of restaurants on Prospect Street.

See APPENDIX 2 - Site Location/Plans & APPENDIX 3 - Site Photographs

1.2.2 Rear Elevation

The rear of the building (rear elevations and gardens) is overlooked by the rear elevation of commercial premises on Prospect Street; Bina Tandoori (21 Prospect Street) possesses 2 kitchen extract duct systems, with the closest only a few metres away from the proposed rear elevation and garden area (left hand side new dwelling).

Bina Tandoori Opening Times:

Monday - Saturday:	18:00 - 23:00 hours
Sunday:	12:00 - 21:30 hours

See APPENDIX 2 - Site Location/Plans & APPENDIX 3 - Site Photographs

1.3 Local Planning Authority

Reading Borough Council have requested a noise impact assessment, particularly considering noise from plant to the rear of Prospect Street.



- 1.4 Sound Planning has been retained to carry out environmental noise measurements and prepare an Acoustic Design Statement to meet target internal noise levels in accordance with relevant standards/guidance.

1.4.1 Participating Acoustic Consultant

Dan Thomas is a Member of the Institute of Acoustics (M.I.O.A) having attained appropriate qualifications in acoustics and experience within the workplace.

1.4.2 Qualifications

Dan has been working within the noise and vibration industry for 12 years and has attained the following qualifications within the field of acoustics:

- Institute of Acoustics (IOA) Diploma
- Post Graduate Diploma in Applied Acoustics and Noise Control
- Masters Degree in Applied Acoustics and Noise Control (University of Surrey)

2.0 ASSESSMENT CRITERIA

The noise assessment and acoustic report should be carried out in accordance with relevant standards and guidelines in conjunction with the Local Authority's validation Unitary Development Plan (UDP).

2.1 The National Planning Policy Framework (July 2018)

2.1.1 The National Planning Policy Framework sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

2.1.2 Planning law requires that applications for planning permission be determined in accordance with the development plan, unless material considerations indicate otherwise. The National Planning Policy Framework must be taken into account in preparing the development plan, and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.



2.1.3 The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

2.1.4 Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

a) **An economic objective** - to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

b) **A social objective** to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities health, social and cultural well-being; and

c) **An environmental objective** to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

2.1.5 The new (2018) NPPF refers to noise at Paragraph 170(e) where it states that:

Planning policies and decisions should contribute to and enhance the natural and local environment by preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

2.1.6 Sound Planning will utilise relevant planning policy such as BS 4142: 2014; BS 8233: 2014, World Health Organisation's Guidelines for Community Noise etc in order to meet the objectives set out within The National Planning Policy Framework July 2018.

2.2 World Health Organisation: Guidelines for Community Noise¹

2.2.1 The W.H.O document covers a wide array of environmental noise issues and appropriate assessment criteria in relation to acceptable noise levels in various situations.

2.2.2 The Guidelines look at appropriate assessment methodology and statistical parameters which are most relevant when looking at particular noise sources; whether they cause annoyance and to what degree.

2.2.3 *The capacity of a noise to induce annoyance depends upon its physical characteristics, including the sound pressure level, spectral characteristics and variations of these properties with time. Noise with low-frequency components require lower guideline values. For intermittent noise, it is emphasized that it is necessary to take into account both the maximum sound pressure level and the number of noise events.*

2.2.4 W.H.O – Amenity Criteria

Specific Environment	Critical Health Effects	L _{Aeq} (dB)	Time Base (hours)	L _{AF} max (dB)
Outdoor Living Area	Serious annoyance, daytime evening	55	16	
	Moderate annoyance, daytime evening	50	16	
Dwelling, Indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	
Inside Bedrooms	Sleep disturbance, night time	30	8	45
Outside Bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

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

¹ World Health Organisation Recommended Levels for Community Noise 2000.

2.3 British Standard 7445-1: 2003²

2.3.1 The methods and procedures described in BS 7445 are intended to be applicable to sounds from all sources, individually and in combination, which contribute to the total noise at a site.

2.3.2 The aim of the BS 7445 series is to provide authorities with material for the description of noise in community environments. Based on the principles described in this standard, acceptable limits of noise can be specified and compliance with these limits can be controlled.

2.3.3 BS 7445 does not specify limits for environmental noise.

2.4 British Standard 8233: 2014³

2.4.1 BS 8233: 2014 is the *Guidance on sound insulation and noise reduction for buildings – Code of practice*.

2.4.2 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, 16hour}

2.4.3 Note 7: *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.*

2.4.4 Note 4: *Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guidance value may be set in terms of SEL of L_{Amax,P} depending on the character and number of events per night. Sporadic noise events could require separate values.*

² Description and measurement of environmental noise. Part 1 – Guide to quantities and procedures.

³ Supersedes BS 8233: 1999.



WHO Guidelines suggest a 45 dB L_{AFmax} criterion for preventing sleep disturbance in bedrooms at night time.

2.4.5 External Amenity Areas (BS 8233: 2014)

For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

2.5 ProPG: Planning and Noise - May 2017

2.5.1 Primary Goals

The primary goal of the ProPG is to assist in the delivery of sustainable development by promoting good health and well-being through the effective management of noise. It seeks to do that through encouraging a good design process in and around proposed new residential development having regard to national policy on planning and noise. The ProPG recommends an approach for new residential development that would be exposed predominantly to noise from existing transport sources; the approach is also considered suitable where some industrial or commercial noise contributes (but is not dominant) to the acoustic environment.

2.5.2 Two Stage Approach

- Stage 1 An initial noise risk assessment of the proposed site
- Stage 2 A systematic consideration of four key elements



2.5.3 Stage 2 - Key Elements

- Element 1 Demonstrating a *Good Acoustic Design Process*
- Element 2 Observing internal *Noise Level Guidelines*
- Element 3 Undertake an *External Amenity Area Noise Assessment*
- Element 4 Consideration of *Other Relevant Issues*

2.5.4 Internal Noise Level Guidelines

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 $L_{Aeq, 16hour}$ 45 dB L_{AFmax} ⁴

2.5.5 External Amenity Area Noise

The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 - 55 dB $L_{Aeq, 16hrs}$.

2.5.6 Acoustic Design Statement

The approach is underpinned by the preparation of an "Acoustic Design Statement".

See APPENDIX 6 for further details.

⁴ In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB L_{AFmax} more than 10 times a night.



2.5.7 Report Recommendations

The approach should lead to one of four possible recommendations from the noise practitioner to the decision maker:

- A *Planning consent may be granted without any need for noise conditions*
- B *Planning consent may be granted subject to the inclusion of suitable noise conditions*
- C *Planning consent should be refused on noise grounds in order to avoid significant adverse effects ("avoid")*
- D *Planning consent should be refused on noise grounds in order to prevent significant adverse effects ("prevent")*

2.6 Noise emissions from mechanical plant should be assessed in accordance with the requirements of British Standard 4142: 2014⁵ - BS 4142: 2014 – Scope:

2.6.1 This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- a) sound from industrial and manufacturing processes;
- b) sound from fixed installations which comprise mechanical and electrical plant and equipment;
- c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

⁵ British Standard 4142: 2014 – Methods for rating and assessing industrial and commercial sound.



The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

2.6.2 This standard is applicable to the determination of the following levels at outdoor locations:

a) rating levels for sources of sound of an industrial and/or commercial nature and

b) ambient, background and residual sound levels, for the purposes of:

- investigating complaints;
- assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and
- assessing sound at proposed new dwellings or premises used for residential purposes.

2.7 BS 4142: 2014 – Assessment of Impacts

2.7.1 The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.

2.7.2 Evaluation of Adverse Impact

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.



- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

2.7.3 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

2.7.4 Objective method for assessing the audibility of tones in sound: One-third octave method

The test for the presence of a prominent, discrete-frequency spectral component (tone) typically compares the $L_{Zeq,T}$ sound pressure level averaged over the time when the tone is present in a one-third-octave band with the time-average linear sound pressure levels in the adjacent one-third-octave bands.

For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference. The level differences between adjacent one-third-octave bands that identify a tone are:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz);
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).

2.7.5 Rating Level

Subjective Method:

Tonality

For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality.



Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

One-third octave method:

Identify tones using the method given in Annex C, then add a correction of 6 dB if a tone is present.

Reference methods

When the one-third octave method is not sufficient, use the reference method for assessing the audibility of tones given in Annex D, which produces a penalty on a sliding scale from 0 dB to 6 dB.

Use the reference method given in Annex E for measuring the prominence of impulsive sounds, which produces penalties in the range 0.0 dB to 9.0 dB.

Other Sound Characteristics

Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Intermittency

When the specific sound has identifiable on/off conditions a penalty of 3 dB can be applied.



3.0 METHODOLOGY

3.1 Sound Planning conducted environmental noise measurements in accordance with BS 7445: 2003⁶.

3.2 Test 1 - Kitchen Extract Atmosphere Discharge (closest extract system)

3.2.1 A UKAS calibrated Type 1 sound level meter microphone was positioned 1m away from the atmospheric discharge of the closest kitchen extract duct riser.

3.2.2 The sound level meter logged statistical parameters in one octave bands for the duration of the measurement period.⁷

3.3 Test 2 - Extended Environmental Noise Monitoring

3.3.1 A UKAS calibrated Type 1 sound level meter was positioned towards the rear of the existing flat roof in a position representative of the rear elevation of the proposed new dwelling closest to the kitchen extract ducts belonging to Bina Tandoori.

See APPENDIX 2 - Site Location/Plans & APPENDIX 3 - Site Photographs

3.3.2 The Sound level meter logged statistical parameters in one octave bands for the duration of the extended monitoring period (24 hours).

3.3.3 The monitoring period commenced at 13:00 hours Tuesday 12th February with continuous measurements (15 minute periods) until 13:30 hours Wednesday 13th February, 2019.

3.4 Internal noise level calculations are based on calculation methods laid out in BS 8233.

3.5 The highest maximum levels L_{max} during the night time periods were selected to evaluate potential sleep disturbance.

3.6 Internal noise level calculations utilise sound reduction data from OEM⁸ laboratory test data sheets i.e. glazing, ventilation manufacturers; and typical sound reduction data from ADE 2003⁹ for composite wall and roof/ceiling systems.

⁶ British Standard BS 7445-1: 2003. *Description and measurement of environmental noise*. ISBN 0 580 43032 4

⁷ Sound level measurements were recorded until the L_{eq} became steady and non-fluctuating.

⁸ Original Equipment Manufacturer.



4.0 INSTRUMENTATION

4.1 Sound Monitoring Equipment

Equipment	Make	Model	Type	Serial Number	UKAS Calibration
SLM	Casella	CEL 490	1	077856	U25583 (17/5/17)
SLM	Norsonic	Nor 140	1	1405819	U28608 (21/5/18)
Field Calibrator	Casella	CEL 110/1	1	077948	U28606 (21/5/18)
Environmental Tripod					
Wind/Weather Shield					
Digital Camera	Samsung				

4.2 Sound Level Meter Calibration

The microphone was field calibrated before and after measurement periods – No significant deviation was detected.

4.3 UKAS Calibration

UKAS Calibration Certificates are available on request.

⁹ Annex C – Draft version of ADE 2003 – Cited Watson et al. *The Little Red Book of Acoustics*. BTA 2007.

5.0 RESULTS

5.1 Ambient Noise Levels (L_{Aeq})

Day of Week	Average Sound Levels	
	Day	Night
	07:00 - 23:00 hrs	23:00 - 07:00 hrs
	dB $L_{Aeq, T}$	dB $L_{Aeq, T}$
Tuesday	55.9	48.3
Wednesday	53.8	/
Log. Average	55.0	

5.2 Noisiest Hours (L_{Aeq})

Day of Week	Noisiest Hours	
	Day	Night
	07:00 - 23:00 hrs	23:00 - 07:00 hrs
	dB $L_{Aeq, T}$	dB $L_{Aeq, T}$
Tuesday	57.8	54.0
Wednesday	57.6	/

5.3 Maximum Night Time Noise Levels (L_{Amax})

Day of Week	Noisiest Night Time Hours		
	1 st Loudest	2 nd Loudest	3 rd Loudest
	dB L_{Amax}	dB L_{Amax}	dB L_{Amax}
Tuesday	65.5	63.4	62.8

5.4 Meteorological Conditions¹⁰

Day	Day/Night	Temperature High/Low (°C)	Av. Wind Speed (km/h)	Wind Direction	Precipitation (mm)
Tuesday	Day	12 / 7	9	SW	0
Tuesday	Night	9 / 7	2	Variable	0
Wednesday	Day	12 / 8	6	Variable	0

6.0 CRITERIA ASSESSMENT

6.1 ProPG Noise Risk Assessment

6.1.1 Daytime:

Sound level: 55 dB L_{Aeq, 16hrs}

Comment:

At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

6.1.2 Night Time:

Sound Level: 48 dB L_{Aeq, 8hrs}

Comment:

At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

¹⁰ Source: Wunderground.com

6.2 BS 8233: 2014 Evaluation

6.2.1 Noisiest Hours

Sound Level (to 1DP)		Sound Insulation Requirement (BS 8233: 2014)	
Day	Night	Living Rooms ¹¹	Bed Rooms ¹²
dB $L_{Aeq, T}$	dB $L_{Aeq, T}$	dB R_w	dB R_w
58	54	23	24

6.2.2 Maximum Internal Noise Levels (Night Time)¹³

Maximum Level (to 1DP)	Maximum Internal Level Permitted	Sound Insulation Requirement (bedrooms)
dB L_{Amax}	dB L_{Amax}	dB R_w
66	45	21

6.3 BS 4142: 2014 - Acoustic Features

6.3.1 Tonality:

The level differences between adjacent one-third-octave bands that identify a tone are:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz);
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).

No tone has been identified - See APPENDIX 4 - Noise Measurements (graph).

¹¹ Target internal level 35 dB L_{Aeq} .

¹² Target internal level 30 dB L_{Aeq} .

¹³ Highest level measured.



6.3.2 Impulsivity:

The extract fan noise is relatively smooth and continual.

No impulsivity.

6.3.3 Intermittency:

Extract Fan switched on 12:15 - 14:00 hours and 18:15 - 23:00 hours

Extract Fan switched off between 14:00 - 18:15 hours and off from 23:00 - 12:15 hours

The extract fan noise is relatively smooth and continual.

Noise source should not be considered intermittent, however there are clear on and off periods (albeit lengthy periods).

6.3.4 Other Sound Characteristics

Kitchen extract noise is readily distinctive against the residual acoustic environment.

Penalty: 3 dB

7.0 NOISE MITIGATION

7.1 Discussion

7.2.1 Acoustic Features

Glazing and ventilation products will be specified based on the C_{tr} sound performance adaption; used for low frequency sound sources e.g. commercial kitchen extract fans.

No glazing has been proposed for the western elevation closest to Bina Tandoori; this elevation overlooks the rear of the restaurant (bins etc) and would have direct line of sight to the closest kitchen extract system (duct riser).



7.2.2 External Amenity Area

External amenity area noise levels just fall into the acceptable category 50 - 55 dB $L_{Aeq, 16hrs}$.

BS 8233: 2014 / WHO 2000 - 55 dB $L_{Aeq, 16hrs}$ is the *upper guideline value*.

ProPG - noise levels should ideally not be above the range 50 - 55 dB $L_{Aeq, 16hrs}$.

7.2.3 Noise Mitigation Products (permission required)

The proposed external amenity areas are acceptable but could be improved by installing in-line duct attenuators within the existing kitchen extract systems (3) within the localised area; this could be achieved by replacing (a section of) duct riser with a duct attenuator. This could noticeably reduce (proposed) garden noise levels < 50 dB $L_{Aeq, 16hrs}$.

Permission would be required from Bina Tandoori and other kitchen extract duct owner.

Pressure drop calculations would need to be carried out in line with fan tolerances.

7.3 Example Glazing Sound Insulation Products/Systems¹⁴

Rooms	Glazing Product	Sound Insulation Performance
		dB $R_w^{15} / R_w + C_{tr}^{16}$
Living Rooms	4mm / 6 - 16mm / 4mm	29 / 25
Bedrooms	4mm / 6 - 16mm / 4mm	29 / 25

¹⁴ It has been assumed that the external wall is brick/brick or brick/block cavity wall.

¹⁵ dB R_w - Overall weighted sound reduction.

¹⁶ dB $R_w + C_{tr}$ [C_{tr} is an adjustment to R_w scale which corrects performance to allow for low frequency components found in commercial noise sources].



7.4 Example Ventilation Sound Insulation Products/Systems

Rooms	Fresh Air Vents ¹⁷	Sound Insulation Performance
		dB D _{n,e} W / D _{n,e} W (C _{tr})
Living Rooms	Greenwood 5000AW AC1	39 / 37
Bedrooms	Greenwood 5000AW AC1	39 / 37

7.5 Suppliers

Product	Supplier	Contact Telephone Number
Glazing	Pilkington (NSG Group)	01744 692000
Ventilation	Greenwood Air Management	01903 771021

8.0 CONCLUSIONS

8.1 A detailed noise assessment, providing full details of existing daytime and night time noise levels at the site, proposed attenuation methods and predicted internal noise levels has been carried out by Sound Planning Ltd.

8.2 Noise measurements were carried out in accordance with BS 7445: 2003.

See section 3.0 – METHODOLOGY

¹⁷ Example products. Ventilation contractor should install vents which achieve $\geq$ sound insulation performance stated. Sound Planning has included alternative product ranges from Greenwood and Rytons - see APPENDIX 5 - Sound Insulation Products.



8.3 ProPG Noise Risk Assessment

8.3.1 Daytime:

At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

8.3.2 Night Time:

At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

- 8.3 The noisiest hours and maximum night time noise levels (from a 24 hour measurement period) have been detailed and used in the design of a suitable noise insulation scheme.

See section 4.0 - RESULTS

- 8.4 Sound Planning has proposed an internal noise insulation scheme in order to meet the requirements of BS 8233: 2014 whilst considering penalties applicable to BS 4142: 2014.¹⁸

See sections 6.0 – CRITERIA ASSESSMENT and 7.0 – NOISE MITIGATION

8.5 Amenity Area Noise - Rear Gardens

- 8.5.1 External amenity area noise levels just fall into the acceptable category 50 - 55 dB L_{Aeq, 16hrs}.

- 8.5.2 The proposed external amenity areas are acceptable but could be improved by installing duct attenuators within the existing kitchen extract systems (3) within the localised area. Permission from system owners would be required.

See APPENDIX 7 - Noise Mitigation Products

¹⁸ Sound Planning has recommended sound insulation products which have accounted for low frequency noise contribution of kitchen extract fans.



APPENDIX 1

Glossary of Acoustic Terms

The Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2×10^{-5} pascals) and the threshold of pain is around 120 dB. The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, L_w is expressed in decibels, referenced to 10^{-12} watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

Noise Rating

The Noise Rating (NR) system is a set of octave band sound pressure level curves used for specifying limiting values for building services noise. The Noise Criteria (NC) and Preferred Noise Criteria (PNC) systems are similar.

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).



Noise Descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow.

$L_{Aeq, T}$ *The most widely applicable unit is the equivalent continuous A-weighted sound pressure level ($L_{Aeq, T}$). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound.*

L_{AE} *Where the overall noise level over a given period is made up of individual noise events, the $L_{Aeq, T}$ can be predicted by measuring the noise of the individual noise events using the sound exposure level, L_{AE} (or SEL or L_{AX}). It is defined as the level that, if maintained constant for a period of one second, would deliver the same A-weighted sound energy as the actual noise event.*

L_{A10} *The level exceeded for 10% of the time is often used to describe road traffic noise.*

L_{A90} *The level exceeded for 90% of the time is normally used to describe background noise.*

Sound Transmission Descriptors

D_{nT} Standardised level difference

$D_{nT, w}$ Weighted standardised level difference

L_1 The average sound pressure level in the source room

L_2 The average sound pressure level in the receiving room

T Reverberation time (receiving room)

T_0 Reference reverberation time = 0.5s

C_{tr} Adaption spectrum which takes account for low to medium speed road/rail/air traffic; disco music; and factory noise (medium to low frequency noise).

C Adaption spectrum which takes account of domestic activities including speech, music, radio and television.

R_{TRA} Traffic Noise Reduction



Frequency Analysis

Octave Band	<i>A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000 Hz...</i>
One Third Octave	<i>The logarithmic frequency interval between a lower frequency f_2, when f_2/f_1 equals $2^{1/3}$ apart. Frequencies include: 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000Hz.</i>

Sound Transmission in the Open Air

Most sources of sound can be characterised as a single point in space. The sound energy radiated is proportional to the surface area of a sphere centred on the point. The area of a sphere is proportional to the square of the radius, so the sound energy is inversely proportional to the square of the radius. This is the inverse square law.

In decibel terms, every time the distance from a point source is doubled, the sound pressure level is reduced by 6 dB. Road traffic noise is a notable exception to this rule, as it approximates to a line source, which is represented by the line of the road. The sound energy radiated is inversely proportional to the area of a cylinder centred on the line. In decibel terms, every time the distance from a line source is doubled, the sound pressure level is reduced by 3 dB.

Factors Affecting Sound Transmission in the Open Air

Reflection

When sound waves encounter a hard surface, such as concrete, brickwork, glass, timber or plasterboard, it is reflected from it. As a result, the sound pressure level measured immediately in front of a building façade is approximately 3 dB higher than it would be in the absence of the façade.

Screening and Diffraction

If a solid screen is introduced between a source and receiver, interrupting the sound path, a reduction in sound level is experienced. This reduction is limited, however, by diffraction of the sound energy at the edges of the screen. Screens can provide valuable noise attenuation however. For example, a timber boarded fence built next to a motorway can reduce noise levels on the land beyond, typically by around 10 dB(A). The best results are obtained when a screen is situated close to the source or close to the receiver.



Meteorological Effects

Temperature and wind gradients affect noise transmission, especially over large distances. The wind effects range from increasing the level by typically 2 dB downwind, to reducing it by typically 10 dB upwind – or even more in extreme conditions. Temperature and wind gradient are variable and difficult to predict.

APPENDIX 2

Site Location/Plans

Google Earth Site View



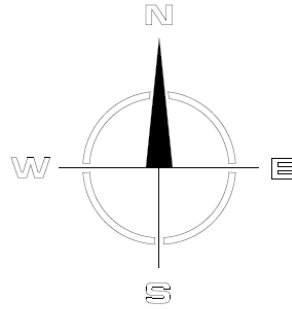
2 North Street, Cavesham

Site Location/Plans

Plans



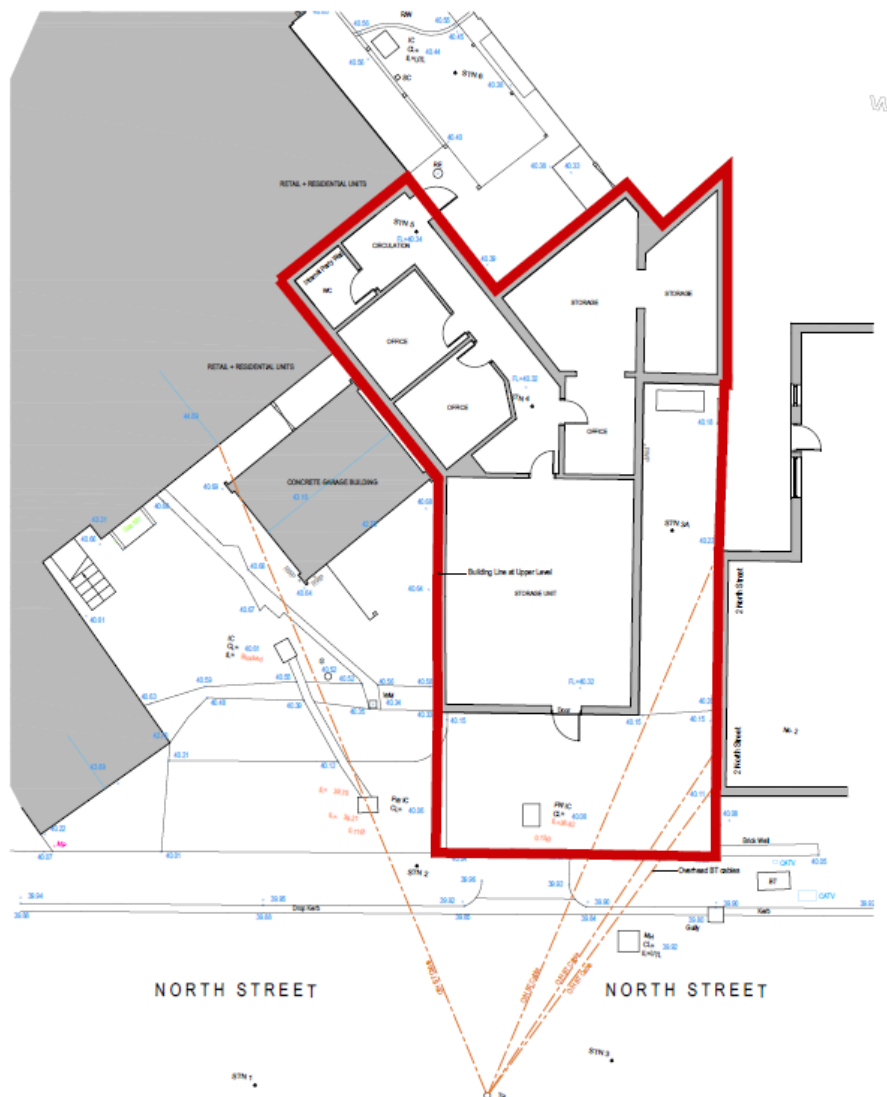
Ordnance Survey, (c) Crown Copyright 2018. All rights reserved. Licence number 100022432



Site Location Plan - 1:1250 @ A1

Site Location/Plans

Existing Plans



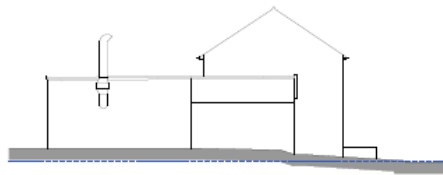
Existing Site Plan - 1:200 @ A1

Site Location/Plans

Existing Plans



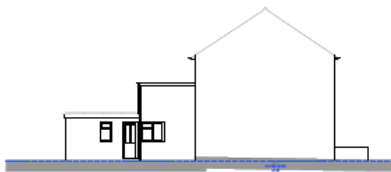
Existing Street Scene/Front elevation - 1:100 @ A1
*elevation 2 + 3



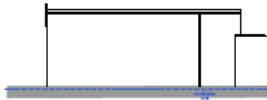
Existing Side elevation - 1:100 @ A1
*elevation 1 + 4



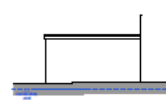
Existing elevation key - NTS



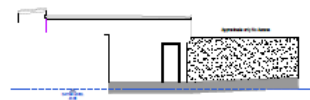
Existing Side Elevation of No.2 - 1:100 @ A1
*elevation 4



Existing Side Elevation - 1:100 @ A1
*elevation 5



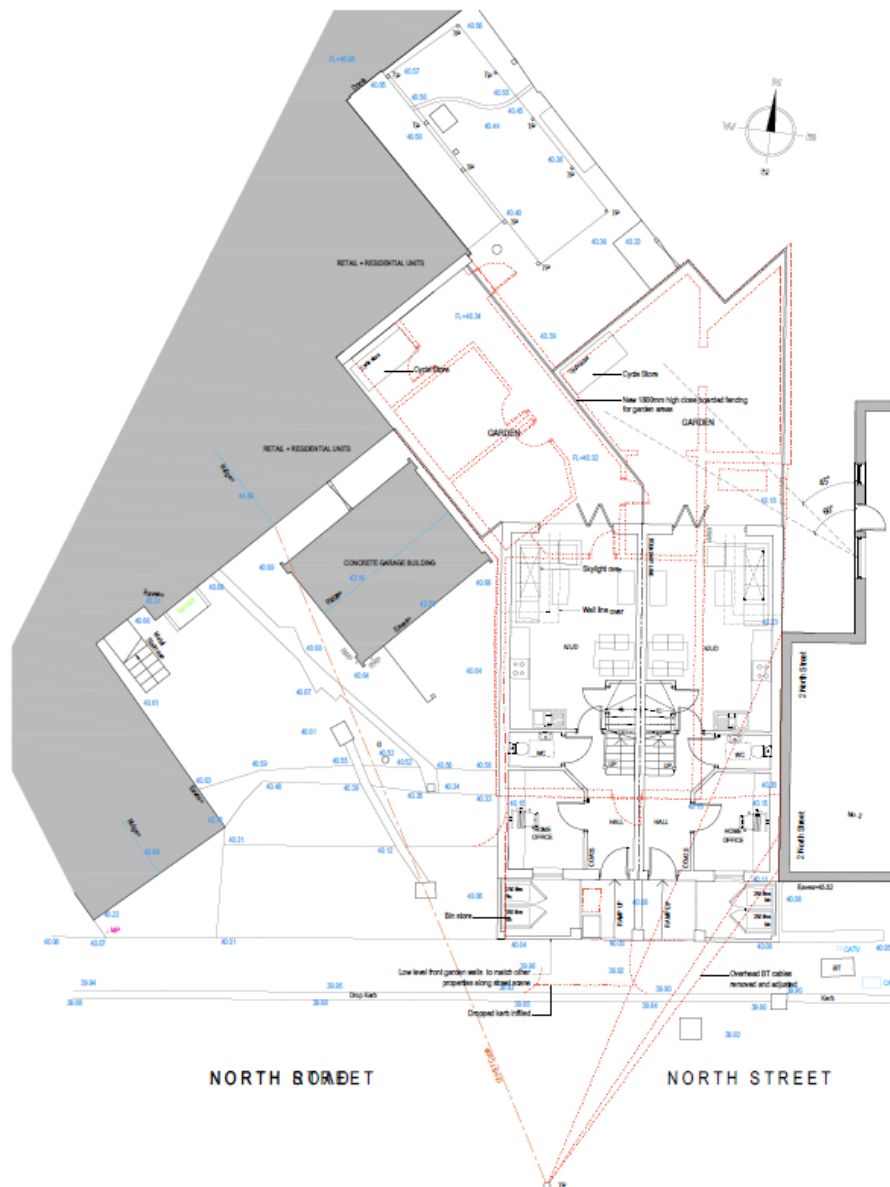
Existing Side Elevation - 1:100 @ A1
*elevation 6



Existing Side Elevation - 1:100 @ A1
*elevation 7

Site Location/Plans

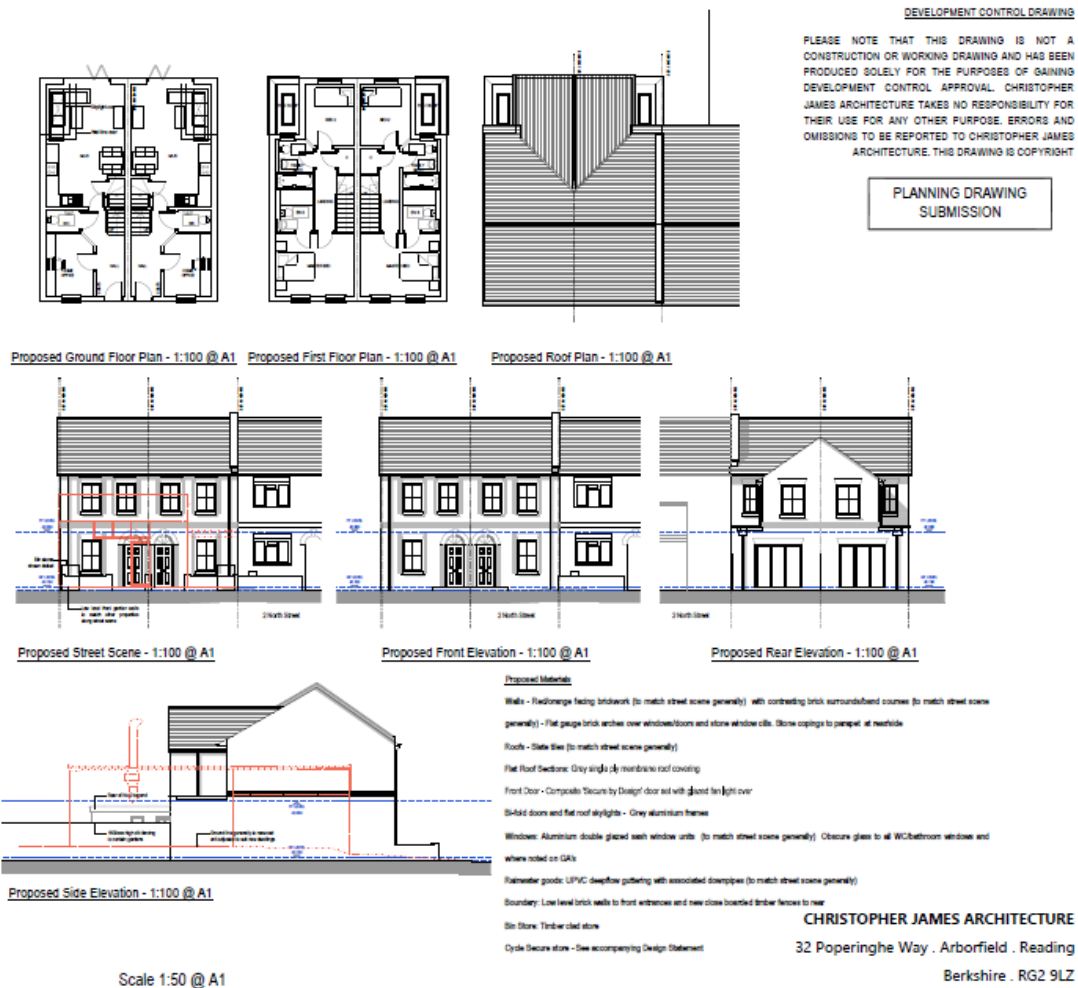
Proposed Plans



Proposed Site Plan and Ground Floor Plan - 1:100 @ A1

Site Location/Plans

Proposed Elevations

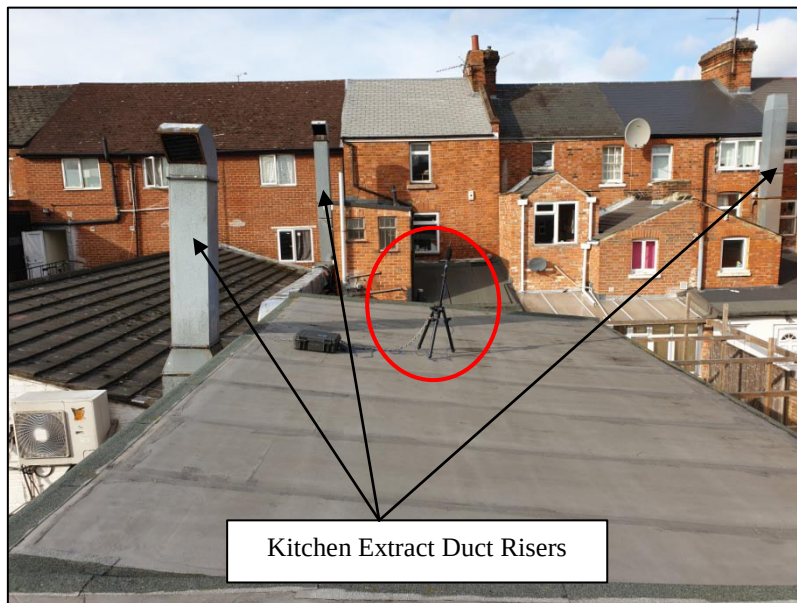


APPENDIX 3

Site Photographs



Microphone Position - View from North Street



Microphone Position - View from roof



APPENDIX 4

Noise Measurements

Kitchen Extract Duct @ 1m

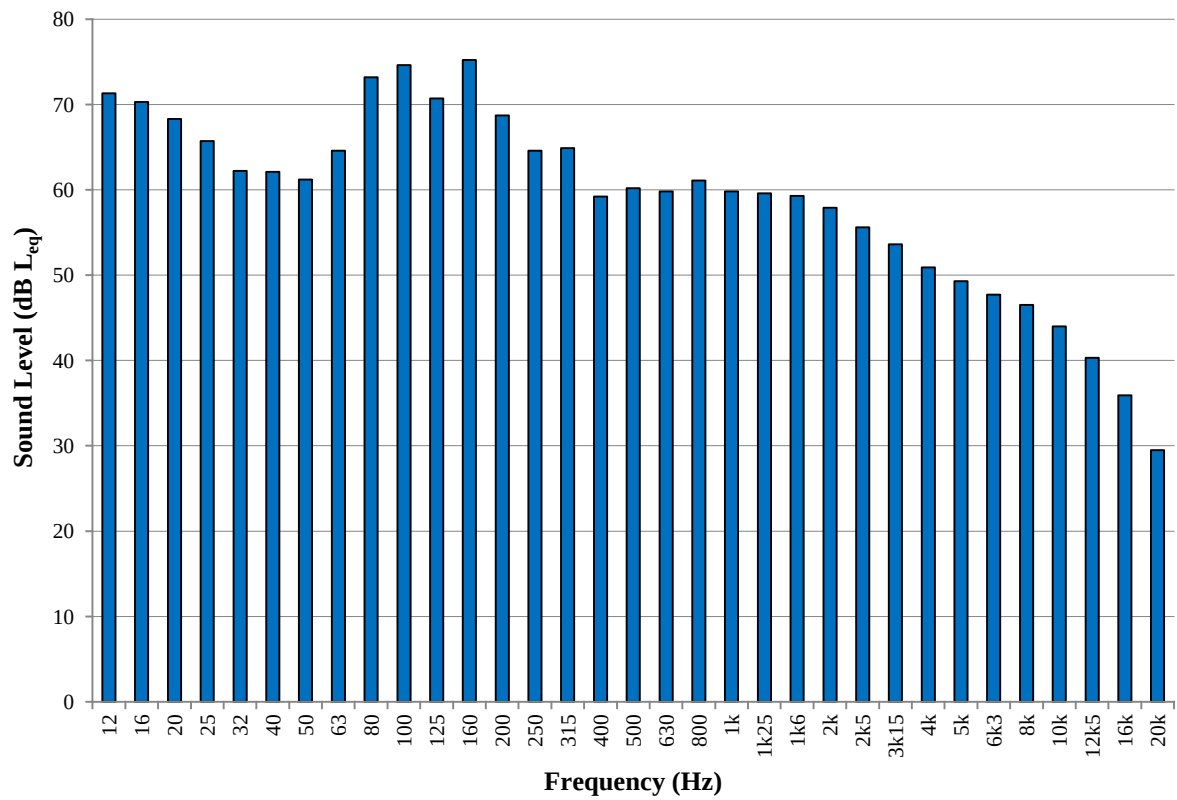
Table

Hz	dB	dB	dB	dB	dB	dB
Band	L _{Fmax}	L _{Fmin}	L _{eq}	L _{F10}	L _{F50}	L _{F90}
Z	91.8	79.5	84.1	86.5	83	81.5
A	71.7	69.7	70.6	71	70.5	70
12	84.4	56.4	71.3	75	68	61
16	82.4	51.8	70.3	74.5	66	60
20	79.1	55.4	68.3	72.5	64.5	59.5
25	73.3	55.2	65.7	69	64	60
32	72	46.4	62.2	66	60	54.5
40	75.4	51.8	62.1	64.5	60.5	57
50	70.2	53.8	61.2	63.5	60.5	57.5
63	70.1	57.1	64.6	67	64	61.5
80	79.6	65.7	73.2	75	73	70.5
100	79.1	68.2	74.6	76.5	74.5	72
125	76.7	64.2	70.7	72.5	70.5	68
160	77.5	72.5	75.2	76	75	74
200	73.6	62.5	68.7	70	68.5	66.5
250	68.6	60.5	64.6	66	64.5	63
315	69.3	60.3	64.9	66.5	64.5	63
400	63.5	55.8	59.2	60.5	59	58
500	63.8	57.3	60.2	61.5	60	58.5
630	62.6	57.3	59.8	60.5	59.5	58.5
800	63.4	58.3	61.1	62	61	60
1k	61.7	57.4	59.8	60.5	59.5	59
1k25	61.4	57.6	59.6	60.5	59.5	59
1k6	61.7	57.4	59.3	60	59.5	58.5
2k	59.5	56.5	57.9	58.5	58	57.5
2k5	57.1	54.4	55.6	56	55.5	55
3k15	55	52	53.6	54	53.5	53
4k	52.3	49.8	50.9	51.5	51	50.5
5k	51	47.9	49.3	50	49	48.5
6k3	49.6	46.6	47.7	48	47.5	47
8k	48.2	45.6	46.5	47	46.5	46
10k	47.4	42.8	44	44.5	44	43.5
12k5	44.5	38.9	40.3	41	40	39.5
16k	40.6	34	35.9	36.5	35.5	35.5
20k	33.8	27.7	29.5	30.5	29.5	28.5

Noise Measurements

Kitchen Extract Duct @ 1m

Graph





Noise Measurements

Extended Ambient Noise Measurements

Table

Date	Time	L _{Aeq}	L _{AFmax}	L _{AFmin}	L _{AF50}	L _{AF90}	L _{Aeq, 1hr}
		(dB)	(dB)	(dB)	(dB)	(dB)	(dB)
12/2/2019	13:00	58.2	63.1	55.9	58.1	57.1	57.8
12/2/2019	13:15	57.4	62	55.6	57.3	56.7	
12/2/2019	13:30	57.8	64.9	56	57.6	56.9	
12/2/2019	13:45	57.6	63.5	55.6	57.4	56.6	
12/2/2019	14:00	58.2	76.6	47.7	57.9	53.1	53.7
12/2/2019	14:15	49.7	61.4	46	49.1	47.7	
12/2/2019	14:30	49.9	62.5	45.6	48.6	47.4	
12/2/2019	14:45	49.4	60.4	45.8	48.3	47.1	
12/2/2019	15:00	48.8	54.7	46.2	48.6	47.5	49.6
12/2/2019	15:15	51.5	64.9	46.1	49.1	47.7	
12/2/2019	15:30	48.6	56.3	45.9	48.3	47.3	
12/2/2019	15:45	48.8	65.2	46.1	48.4	47.6	
12/2/2019	16:00	50.8	67.5	46.7	48.8	47.9	53.3
12/2/2019	16:15	52.2	67.5	46.8	49.3	48.2	
12/2/2019	16:30	56.7	83.6	46.7	49.5	48	
12/2/2019	16:45	50.3	63.5	46.3	48.9	47.8	
12/2/2019	17:00	50.3	65.1	46.4	48.6	47.7	54.2
12/2/2019	17:15	52	63.9	46.4	48.9	47.8	
12/2/2019	17:30	54.9	74.8	47.1	55.9	48.3	
12/2/2019	17:45	56.8	65.7	55.2	56.7	56.1	
12/2/2019	18:00	57.3	67.6	55.1	57.1	56.2	57.2
12/2/2019	18:15	56.9	59.4	55.2	56.8	56.1	
12/2/2019	18:30	57.4	63.5	55.3	57.2	56.3	
12/2/2019	18:45	57	67.3	55.2	56.7	56.1	
12/2/2019	19:00	57.8	65.8	55.4	57.8	57	57.5
12/2/2019	19:15	57.4	66.5	55.2	57.3	56.4	
12/2/2019	19:30	57.8	65.3	55.5	57.9	56.7	
12/2/2019	19:45	57	61.4	55.4	56.8	56.2	
12/2/2019	20:00	60	79.8	54.6	59.6	56	57.8
12/2/2019	20:15	56.8	63.8	54.7	56.7	56	
12/2/2019	20:30	56.6	70.4	54	56.4	55.3	
12/2/2019	20:45	56.6	60.3	53.9	56.5	55.6	



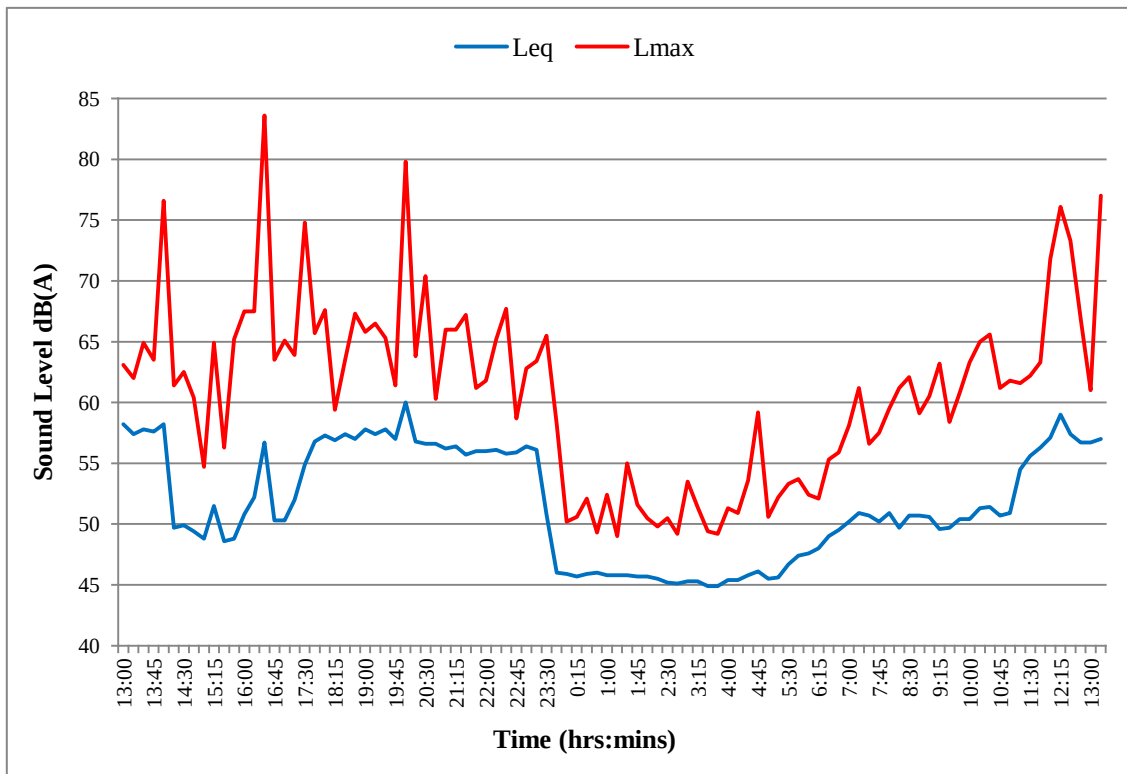
12/2/2019	21:00	56.2	66	54	56.2	55.1	56.1
12/2/2019	21:15	56.4	66	53.9	56.4	55.7	
12/2/2019	21:30	55.7	67.2	53.8	55.3	54.8	
12/2/2019	21:45	56	61.2	53.9	56	55	
12/2/2019	22:00	56	61.8	54.3	55.9	55.2	56.0
12/2/2019	22:15	56.1	65.2	53.9	56	55	
12/2/2019	22:30	55.8	67.7	53.7	55.6	54.8	
12/2/2019	22:45	55.9	58.7	54	55.9	54.9	
	Day 1	55.9	dB L _{Aeq, T}				
12/2/2019	23:00	56.4	62.8	54.4	56.4	55.8	54.0
12/2/2019	23:15	56.1	63.4	54	56.2	55	
12/2/2019	23:30	50.8	65.5	43.8	46.3	45.1	
12/2/2019	23:45	46	58.2	43.8	45.5	44.9	
13/12/2019	0:00	45.9	50.2	43.8	45.6	45.1	45.9
13/12/2019	0:15	45.7	50.6	44	45.5	44.9	
13/12/2019	0:30	45.9	52.1	44.3	45.7	45.2	
13/12/2019	0:45	46	49.3	44.3	45.8	45.2	
13/12/2019	1:00	45.8	52.4	44	45.5	45	45.8
13/12/2019	1:15	45.8	49	44.1	45.6	45	
13/12/2019	1:30	45.8	55	44.1	45.4	45	
13/12/2019	1:45	45.7	51.6	44.1	45.5	45	
13/12/2019	2:00	45.7	50.5	44.1	45.6	45	45.4
13/12/2019	2:15	45.5	49.8	44.1	45.3	44.9	
13/12/2019	2:30	45.2	50.5	43.2	44.9	44.3	
13/12/2019	2:45	45.1	49.2	43.2	44.9	44.3	
13/12/2019	3:00	45.3	53.5	43.5	45.1	44.5	45.1
13/12/2019	3:15	45.3	51.4	43.7	45.1	44.6	
13/12/2019	3:30	44.9	49.4	43.2	44.7	44.2	
13/12/2019	3:45	44.9	49.2	43.3	44.8	44.2	
13/12/2019	4:00	45.4	51.3	43.5	45.1	44.5	45.7
13/12/2019	4:15	45.4	50.9	43.7	45.1	44.6	
13/12/2019	4:30	45.8	53.6	43.6	45.4	44.7	
13/12/2019	4:45	46.1	59.2	43.6	45.4	44.8	
13/12/2019	5:00	45.5	50.6	43.6	45.1	44.5	46.4
13/12/2019	5:15	45.6	52.2	43.3	45.1	44.4	
13/12/2019	5:30	46.7	53.3	43.6	46.3	45.1	
13/12/2019	5:45	47.4	53.7	45.2	47	46.1	
13/12/2019	6:00	47.6	52.4	44.8	47.2	46	48.6
13/12/2019	6:15	48	52.1	45	47.8	46.4	

13/12/2019	6:30	49	55.3	45.3	48.6	47.1	
13/12/2019	6:45	49.5	55.9	46.2	49.3	47.7	
	Night 1	48.3	dB L _{Aeq, T}				
13/12/2019	7:00	50.2	58.1	47.1	49.9	48.8	50.5
13/12/2019	7:15	50.9	61.2	47.7	50.7	49.4	
13/12/2019	7:30	50.7	56.6	48.2	50.5	49.5	
13/12/2019	7:45	50.2	57.5	48	49.9	49.1	
13/12/2019	8:00	50.9	59.5	48	50.4	49.3	50.5
13/12/2019	8:15	49.7	61.2	47.7	49.6	48.7	
13/12/2019	8:30	50.7	62.1	47.9	50.1	49.2	
13/12/2019	8:45	50.7	59.1	48.3	50.3	49.4	
13/12/2019	9:00	50.6	60.5	47.7	50	49	50.1
13/12/2019	9:15	49.6	63.2	46.9	49.3	48.4	
13/12/2019	9:30	49.7	58.4	46.7	49.3	48.5	
13/12/2019	9:45	50.4	60.8	47	49.2	48.2	
13/12/2019	10:00	50.4	63.3	46.6	49.3	47.9	51.0
13/12/2019	10:15	51.3	65	46.8	49.6	48.4	
13/12/2019	10:30	51.4	65.6	47.1	49.8	48.5	
13/12/2019	10:45	50.7	61.2	46.8	50	48.7	
13/12/2019	11:00	50.9	61.8	47.1	50.2	48.7	54.8
13/12/2019	11:15	54.5	61.6	46.6	55.1	48.5	
13/12/2019	11:30	55.6	62.2	53.9	55.4	54.9	
13/12/2019	11:45	56.3	63.3	53.8	56.1	55.2	
13/12/2019	12:00	57.1	71.8	54.8	56.4	55.8	57.6
13/12/2019	12:15	59	76.1	54.7	56.9	56.1	
13/12/2019	12:30	57.4	73.3	54.9	56.5	55.9	
13/12/2019	12:45	56.7	66.9	54.9	56.6	56.1	
13/12/2019	13:00	56.7	61	55	56.6	56	
13/12/2019	13:15	57	77	54.8	56.5	55.9	
	Day 2	53.8	dB L _{Aeq, T}				

Noise Measurements

Extended Ambient Noise Measurements

Graph



Notes:

L_{eq}: Extract Fan on 12:15 - 14:00 hours and 18:15 - 23:00 hours

L_{eq}: Extract Fan switched off between 14:00 - 18:15 hours and off from 23:00 - 12:15 hours

L_{max}: Dropping rubbish in bins (?)

APPENDIX 5

Sound Insulation Products

Glazing

Sound insulation data for standard products

Glass	Sound reduction index (dB)									
	Octaveband Centre Frequency (Hz)						$R_w(C;C_w)$	R_w	R_w+C	R_w+C_w
	125	250	500	1000	2000	4000				
Single glazing										
4 mm Float Glass	17	20	26	32	33	26	29 (-2; -3)	29	27	26
6 mm Float Glass	18	23	30	35	27	32	31 (-2; -3)	31	29	28
8 mm Float Glass	20	24	29	34	29	37	32 (-2; -3)	32	30	29
10 mm Float Glass	23	26	32	31	32	39	33 (-2; -3)	33	31	30
12 mm Float Glass	27	29	31	32	38	47	34 (0; -2)	34	34	32
6 mm Laminated Glass	20	23	29	34	32	38	32 (-1; -3)	32	31	29
8 mm Laminated Glass	20	25	32	35	34	42	33 (-1; -3)	33	32	30
10 mm Laminated Glass	24	26	33	33	35	44	34 (-1; -3)	34	33	31
12 mm Laminated Glass	24	27	33	32	37	46	35 (-1; -3)	35	34	32
Insulating glass units										
4 mm / (6 - 16 mm) / 4 mm	21	17	25	35	37	31	29 (-1; -4)	29	28	25
6 mm / (6 - 16 mm) / 4 mm	21	20	26	38	37	39	32 (-2; -4)	32	30	28
6 mm / (6 - 16 mm) / 6 mm	20	18	28	38	34	38	31 (-1; -4)	31	30	27
8 mm / (6 - 16 mm) / 4 mm	22	21	28	38	40	47	33 (-1; -4)	33	32	29
8 mm / (6 - 16 mm) / 6 mm	20	21	33	40	36	48	35 (-2; -6)	35	33	29
10 mm / (6 - 16 mm) / 4 mm	24	21	32	37	42	43	35 (-2; -5)	35	33	30
10 mm / (6 - 16 mm) / 6 mm	24	24	32	37	37	44	35 (-1; -3)	35	34	32
6 mm / (6 - 16 mm) / 6 mm Laminated	20	19	30	39	37	46	33 (-2; -5)	33	31	28
6 mm / (6 - 16 mm) / 10 mm Laminated	24	25	33	39	40	49	37 (-1; -5)	37	36	32

The above are generally accepted values for generic products taken from EN 12758. They are conservative values that can be used in the absence of measured data.

Data for laminated glass is based on pvb interlayers (excluding acoustic pvb interlayers). Glass thickness for laminated glass excludes interlayer thickness.

Data can be adopted for air or argon gas-filled cavities

R_w = Weighted sound reduction. This scale allows for the response of the human ear and could be used for determining a suitable product to reduce noise such as voices.

C = An adjustment to the R_w scale that could be used for selecting a product to reduce noise from music, radio, tv, high speed traffic and other medium to high frequencies.

C_w = An adjustment to the R_w scale that could be used for selecting a product to reduce noise from urban road traffic, disco music and other noises with a large component of low frequencies.

Sound Insulation Products

Glazing



Pilkington Optiphon™

Glass	Sound reduction index (dB)									
	Octaveband Centre Frequency (Hz)						$R_w(C;C_w)$	R_w	R_w+C	R_w+C_w
	125	250	500	1000	2000	4000				
Single glazing										
6.8 mm Pilkington Optiphon™	26	27	31	36	40	39	36 (-1; -4)	36	35	32
8.8 mm Pilkington Optiphon™	24	28	34	38	37	43	37 (-1; -4)	37	36	33
9.1 mm Pilkington Optiphon™	26	29	34	38	38	43	37 (-1; -3)	37	36	34
12.8 mm Pilkington Optiphon™	30	32	37	39	41	51	39 (0; -2)	39	39	37
13.1 mm Pilkington Optiphon™	30	33	37	40	41	50	40 (0; -2)	40	40	38
Insulating glass units										
6 mm / 16 mm argon / 6.8 mm Pilkington Optiphon™	22	27	35	42	41	48	38 (-2; -5)	38	36	33
6 mm / 16 mm argon / 8.8 mm Pilkington Optiphon™	24	26	40	48	46	54	41 (-3; -7)	41	38	34
8 mm / 16 mm argon / 9.1 mm Pilkington Optiphon™	24	29	41	47	47	55	43 (-3; -7)	43	40	36
10 mm / 16 mm argon / 9.1 mm Pilkington Optiphon™	29	33	44	46	49	57	45 (-2; -5)	45	43	40
8.8 mm Pilkington Optiphon™ / 16 mm argon / 12.8 mm Pilkington Optiphon™	26	36	46	50	52	63	47 (-2; -7)	47	45	40
9.1 mm Pilkington Optiphon™ / 20 mm argon / 13.1 mm Pilkington Optiphon™	29	39	49	52	55	63	50 (-3; -8)	50	47	42

Measurements undertaken in accordance with BS EN ISO 10140 and $R_w(C;C_w)$ determined in accordance with BS EN ISO 717-1

For insulating glass units, there is little difference in the sound insulation for cavity widths in the range 6 to 16 mm

Pendulum body impact resistance to BS EN 12600 for all Pilkington **Optiphon™** is Class I (B) 1

To achieve low U values in insulating glass units, Pilkington **Optiphon™** can be combined with low emissivity glass from the Pilkington **K Glass™** or Pilkington **Optitherm™** ranges

To calculate performance data for Pilkington products, please use our Spectrum online calculator at www.pilkington.co.uk/spectrum

For glass combinations to achieve an R_w value higher than 50 dB, please contact us for more details

Sound Insulation Products

Glazing

Table 3 – Double Windows (Secondary Sashes)

Thirdoctaveband Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)					
	6/100/4		6/150/4		10/200/6	
100	25		27		32	
125	27	26	30	29	37	35
160	27		30		39	
200	33		34		45	
250	33	34	34	35	46	46
315	37		39		46	
400	41		42		47	
500	46	44	46	45	45	46
630	50		50		45	
800	54		54		44	
1000	57	56	57	56	45	46
1250	59		58		50	
1600	58		58		53	
2000	52	53	52	52	58	56
2500	51		49		58	
3150	48		47		64	
4000	57	52	52	50	64	65
R _m (dB)	44		44		47	
R _w (dB)	46		47		49	
R _{TRA} (dBA)	37		39		45	

Sound Insulation Products

Acoustic Ventilation

138 Acoustic Ventilation

2500EA / 5000EA

Acoustic window ventilator

Physical specification

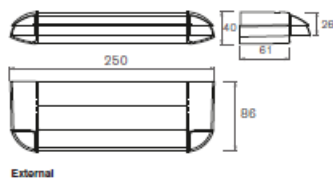
All measurements in millimetres unless otherwise indicated

Materials: Aluminium Alloy

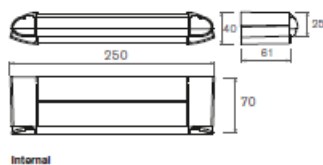
Installation

1. Prepare the window frame with the correct slot sizes.
2. Use the self tapping screws to install the acoustic parts.
3. Use standard pyramid vent screws to install the canopy and vent.

2500EA Acoustic



External



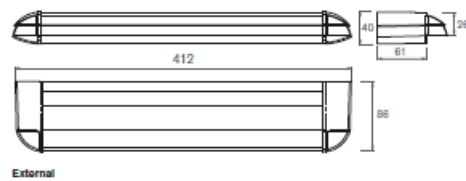
Internal

2500EA Acoustic slot size

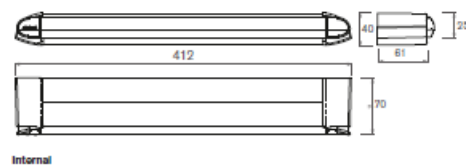
Height: 13mm

Length
192mm

5000EA Acoustic



External



Internal

5000EA Acoustic slot size

Height: 13mm

Length	Central gap	Length
172mm	10mm	172mm

Sound Insulation Products

Acoustic Ventilation

Acoustic Ventilation 139

The best of both worlds... achieves Building Regulations' EA requirements along with fantastic acoustic performances up to 45dB(A)



Features and benefits

- Smallest acoustic window vents providing 2500mm² or 5000mm² equivalent area ventilation on the market
- Achieves the best acoustic performance for window ventilators available within the UK – up to 45dB(A)
- A simple, yet adaptable, solution to meet required specification/ Building Regulation requirements incorporating both high levels of equivalent area ventilation and acoustic noise reduction
- Modularity of acoustic sets provides flexibility for installation and acoustic performance
- Aesthetically pleasing design which is easy to open and control by the homeowner
- Excellent airtightness performance with upward air deflection to reduce the risk of draughts
- May require add on section in some window installations

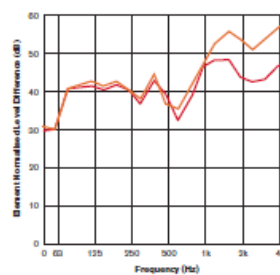
Sets comprise of:

1 EA vent + 1 external acoustic module – providing noise reduction with discreet internal aesthetics.

1 EA vent + 2 acoustic modules (for internal and external install) – providing maximum noise reduction.

Performance

2500EA acoustic performance

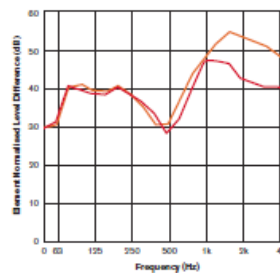


Key

2500EAW.AC1

2500EAW.AC2

5000EA acoustic performance



Key

5000EAW.AC1

5000EAW.AC2

Models, control options and key data

The discount group applied to Acoustic Ventilation is F1

Product code	Description	Controls	Acoustic performance			Equivalent area mm ²	Colour	Price (£)
			Dn,e,w	Dn,e,w (C)	Dn,e,w (Ctr)			
2500EAW.AC1 *	Vent + 1 Acoustic External Module	Front	42dB(A)	41dB	40dB	2670	White	29.92
2500EAW.AC2 *	Vent + 2 Acoustic Modules	Front	45dB(A)	43dB	42dB	2670	White	38.08
5000EAW.AC1 *	Vent + 1 Acoustic External Module	Front	39dB(A)	38dB	37dB	5350	White	44.88
5000EAW.AC2 *	Vent + 2 Acoustic Modules	Front	42dB(A)	40dB	38dB	5350	White	61.20

* Pricing is variable depending on quantity ordered - please call for details

Sound Insulation Products

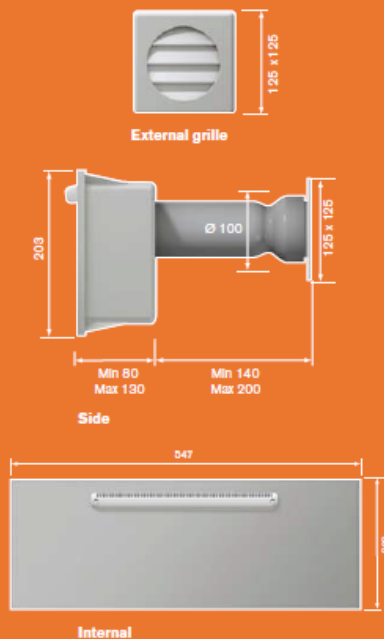
Acoustic Ventilation

MA3051

Acoustic wall ventilator

Physical specification

All measurements in millimetres.



Weight: 2.655 kg
Materials: PVC: Casing for wall vent, duct, external grille and internal ventilator. Acoustic lining and material inside wall vent.

108 GREENWOOD SPECIFIERS GUIDE APRIL 2009

Features

- Acoustic background ventilator
- Provides acoustic attenuation to $D_{n,e} w$ 55dB
- 2500mm² equivalent area performance
- Suitable for external wall thicknesses of 140mm and above
- Internal wall constructions of between 100mm and 150mm
- Supplied with internal controllable vent and white/sand external grilles
- Conforms to a acoustic requirements of Noise Insulation Regulations 1975, one of only a small number of products available in the UK

Controls

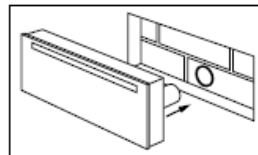
Model	Operation
MA3051	Internal controllable trickle ventilator

Installation

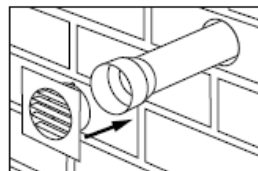
Instructions are provided with product including wall template for cut out.

Bonding compound is required to complete installation.

Protective strip protect internal unit until decoration is complete within dwelling.



Push into cut out in wall



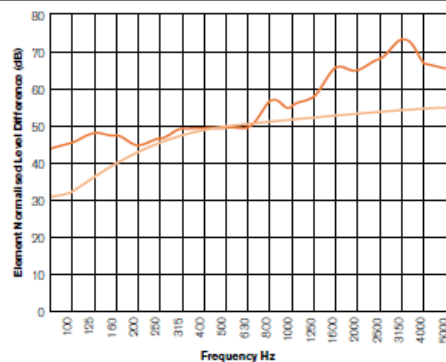
Push fit external grille.

Sound Insulation Products

Acoustic Ventilation

Performance

Model	Acoustic Performance $D_{n,e} W$ (dB)	Equivalent Area mm ²
MA3051	55	2500

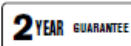


Frequency	100	125	160	200	250	315	400	500
dB	45	48	47	44	46	49	49	49

Frequency	630	800	1000	1250	1600	2000	2500	3150
dB	49	56	54	57	66	65	68	66

$D_{n,e} W$ (C;Ctr) = 55 (-1;-3) dB
 C: Pink Noise
 Ctr: Road Noise

Specification



Acoustic: Ventilation

Considering noise and domestic ventilation together

If life was simple then noise issues would be simply dealt with by swapping standard products for acoustic products.

In some circumstances, this may be achievable, however the nature of acoustic products means that they are generally larger and more bulky and multiple installations, (to achieve higher ventilation rates) of the same product can also effect acoustic performance.

With this in mind, noise and ventilation must be considered together at design. Whole house systems that have limited penetrations in the facade of a building often work well, however a whole range of individual products such as airbricks and wall ventilators are available with db reductions of up to 55.

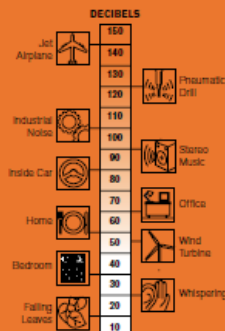
The best thing to do is ask – too many times have buildings been built and then acoustic ventilation been thought about, thus reducing options and sometimes meaning costly re-works on site.

Measuring sound

Sound can be measured in two ways:

- Intensity/Loudness of sound is measured in decibels – dB
- Pitch of sound is measured in frequency of vibrations per second

The decibel scale runs from the faintest sound the human ear can detect (0dB) to over 180dB that is similar to the noise a rocket creates during a launch.





Sound Insulation Products

Acoustic Ventilation



Rytens Background Room Ventilators

Technical information available from our website at:

www.vents.co.uk

Alternatively, call us on 01536 511874

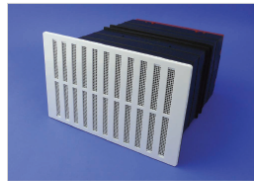


Sound Insulation Products

Acoustic Ventilation

Rytons Controllable Ventilation Sets '9x6'

- Double brick through-wall ventilation sets for the provision of controllable background air to habitable rooms.
- Acoustic options available to reduce noise transfer for a more peaceful environment.
- Multifix® Air Bricks available in a choice of colours to complement external brickwork.
- External water baffles prevent transfer of water across the cavity.
- Internal and external grilles U.V. stabilised to slow down the effects of sunlight.
- Adjustable hit & miss grille gives control over the amount of ventilation let into the room.
- Telescopic cavity liner contains a system of internal baffles to reduce the transmission of light and draughts.
- Equivalent areas tested to BS EN 13141-1:2004 and independently verified by the BRE.
- Acoustic performance tests by BRE Acoustics.



Size Guide	
Optional Cowl:	255mm L x 154mm H x 74mm D
AirLiner®:	Extends from 250mm-404mm L with air bricks fitted
Hit & Miss:	271mm L x 171mm H

Colour Guide	
Optional Cowl:	Terracotta, buff/sand, white
Air Brick:	Terracotta, buff/sand, white, grey, blue/black, black, brown
Hit & Miss:	White

Consider an acoustic option ...
 “ Both road traffic noise and aircraft noise increase the risk of high blood pressure.
 World Health Organization ”

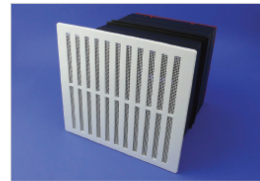
Make quick and easy ventilation calculations anytime with our free online calculators at www.vents.co.uk

Code	Noise Reduction (D _{red})	External Finish	Sleeve Lining	Equivalent Area
Rytons TALH&M	39 dB open 40 dB closed	Air Bricks	Baffles & Acoustic	10,500mm²
Rytons TALHMCWL	42 dB open or closed	Air Bricks & Cowl	Baffles & Acoustic	9,800mm²
Rytons TC18HM	Unsilenced	Air Bricks	Baffles	19,800mm²
Rytons TC18HCWL	Unsilenced	Air Bricks & Cowl	Baffles	18,000mm²

8

Rytons Controllable Ventilation Sets '9x9'

- Triple brick through-wall ventilation sets for the provision of controllable background air to habitable rooms.
- Acoustic options available to reduce noise transfer for a more peaceful environment.
- Multifix® Air Bricks available in a choice of colours to complement external brickwork.
- External water baffles prevent transfer of water across the cavity.
- Internal and external grilles U.V. stabilised to slow down the effects of sunlight.
- Adjustable hit & miss grille gives control over the amount of ventilation let into the room.
- Telescopic cavity liner contains a system of internal baffles to reduce the transmission of light and draughts.
- Equivalent areas tested to BS EN 13141-1:2004 and independently verified by the BRE.
- Acoustic performance tests by BRE Acoustics.



Size Guide	
Optional Cowl:	274mm L x 235mm H x 103mm D
AirLiner®:	Extends from 250mm-404mm L with air bricks fitted
Hit & Miss:	271mm L x 247mm H

Colour Guide	
Optional Cowl:	Terracotta, buff/sand, white
Air Brick:	Terracotta, buff/sand, white, grey, blue/black, black, brown
Hit & Miss:	White

Consider an acoustic option ...
 “ Road traffic noise has been shown to increase the risk of ischaemic heart disease.
 World Health Organization ”

Make quick and easy ventilation calculations anytime with our free online calculators at www.vents.co.uk

Code	Noise Reduction (D _{red})	External Finish	Sleeve Lining	Equivalent Area
Rytons TAL9H&M	38 dB open or closed	Air Bricks	Baffles & Acoustic	12,800mm²
Rytons TAL9HMCWL	40 dB open 41 dB closed	Air Bricks & Cowl	Baffles & Acoustic	12,700mm²
Rytons TC20HM	Unsilenced	Air Bricks	Baffles	30,000mm²
Rytons TC20HCWL	Unsilenced	Air Bricks & Cowl	Baffles	27,000mm²

9

APPENDIX 6

ProPG: Planning & Noise

Noise Risk Assessment

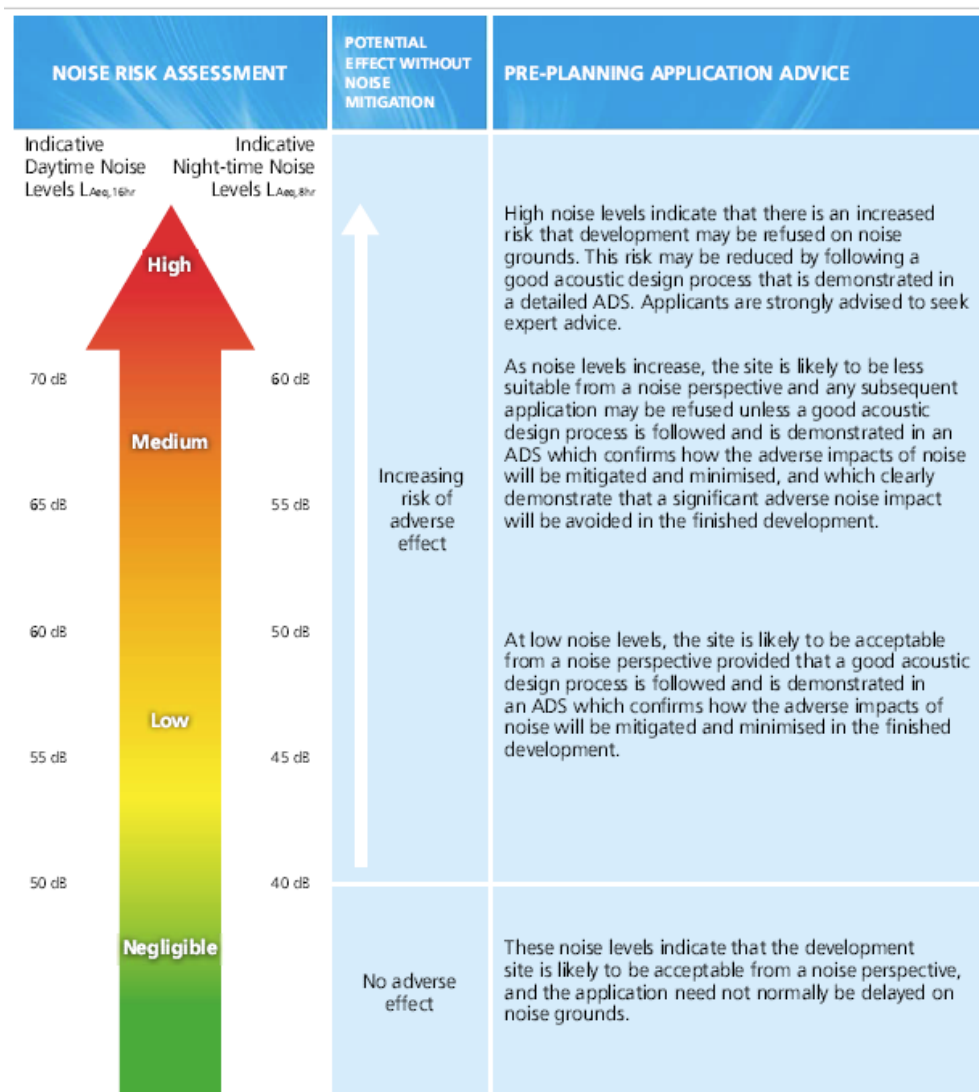


Figure 1 Notes:

- Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.
- Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".
- $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.
- An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.

Figure 1. Stage 1– Initial Site Noise Risk Assessment

ProPG: Planning & Noise

Internal Noise Level Guidelines

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\text{ hr}}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\text{ hr}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\text{ hr}}$	30 dB $L_{Aeq,8\text{ hr}}$ 45 dB $L_{Amax,F}$ (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 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. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (see Section 3.D).

Figure 2. ProPG Internal Noise Level Guidelines (additions to BS8233:2014 shown in blue)

ProPG: Planning & Noise

External Amenity Noise

Element 3 – External Amenity Area Noise Assessment

- 3(i) *"If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended".*
- 3(ii) *"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,1hr}$ ".*
- 3(iii) *"These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces."*
- 3(iv) *Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process.*
- 3(v) *Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:*
- *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
 - *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or*

large open balcony in a different, protected, location); and/or

- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.*



ProPG: Planning & Noise

Acoustic Design Statement

Acoustic Design Statement (ADS)

An ADS for new housing should be proportionate to the scale of development and the extent of noise risk at the development site. An ADS should typically address the following issues:

TYPICAL ISSUES FOR LOW NOISE RISK SITES	ADDITIONAL ISSUES FOR MEDIUM/HIGH NOISE RISK SITES
Relevant noise sources identified	Multiple source contributions carefully quantified
Assess extent of noise risk for unmitigated site (current and foreseeable future, 15 years ahead)	Greater coverage across the site (all buildings, all relevant heights)
	Alternative site layouts considered
	Adequate non-sensitive use for screening
Opportunities to mitigate the noise source within the site	Opportunities to mitigate the noise source outside owned land Physical mitigation, operational management
Maximise separation	Existing topographical advantages Change site level
Noise barriers – screening opportunities	Barriers inside and outside the site
Site layout – protecting residential units	Design external amenity spaces (e.g. balconies) to reduce noise entering sensitive rooms
Site layout – protecting external amenity space	Access to quiet open space on or off-site
Non-sensitive elements as screens	Non-sensitive elements designed as screens
Building layout to self-screen sensitive rooms	Orientation of noise sensitive rooms away from the source of noise exposure i.e. quiet facades
Building treatment to screen openings	Consideration of alternative acoustic options
Window location & size on affected facades	Innovative facade and window designs e.g. plenum windows
	Façade insulation design
Ventilation – natural, from quiet facade	Acoustic performance of ventilation, thermal comfort
	Complete Acoustic Design Process throughout

Figure 3. Typical acoustic design issues to be included in an ADS

ProPG: Planning & Noise

Summary

Summary

3.16 A summary of the overall ProPG approach is provided in *Figure 4*.

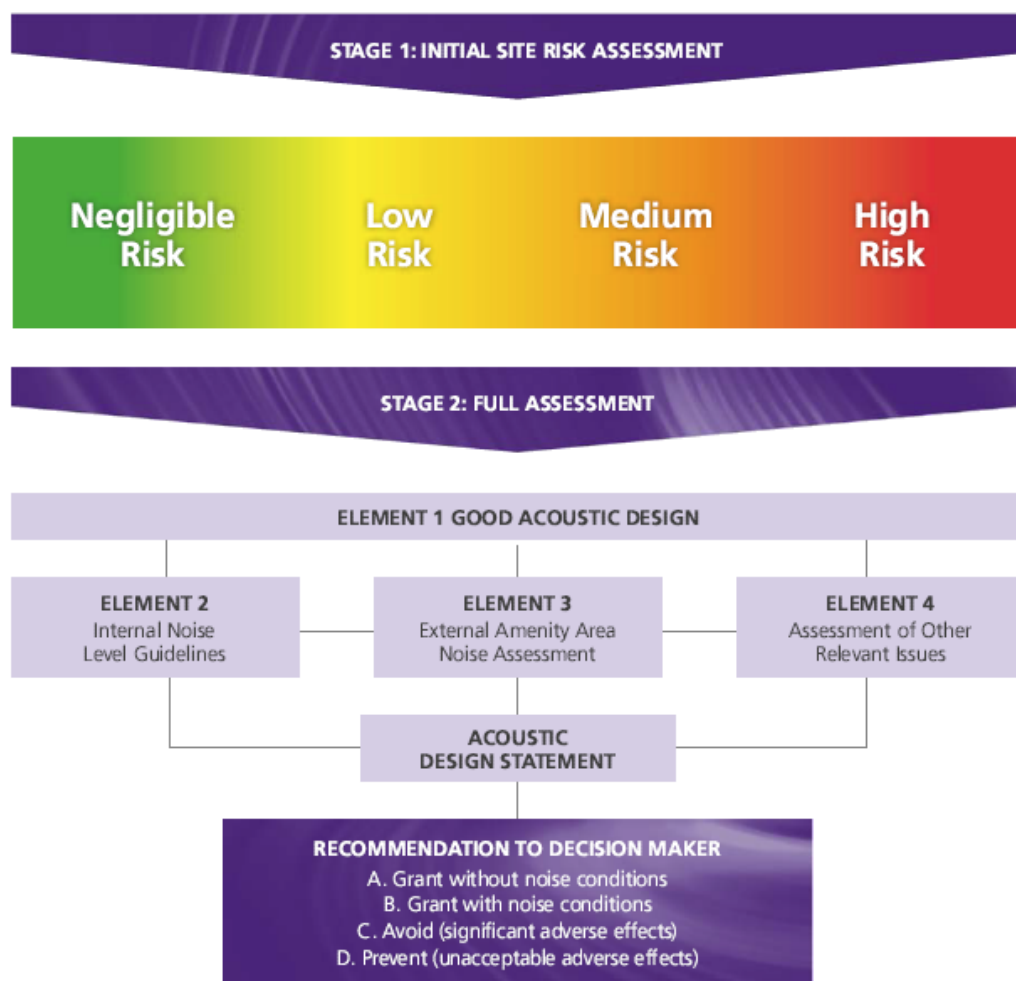


Figure 4 Summary of overall ProPG approach

APPENDIX 7

Noise Mitigation Products

Flakt Wood Attenuators

Splitter Silencers

Coding: Type WS/WSE Silencers

Code

WS Drilled Flanges (with Side Liners)
 WSY Cleat Flanges (with Side Liners)
 M Moisture Resistant Lining
 L Low Pressure Loss
 P High System Pressure
 K Fume Resistant
 C Perforated Linings
 CC Stainless Perforated Linings

Example

WSY LM/75-X-X-X

Type _____
 Variants _____
 Airway _____
 Width mm _____
 Silencer _____
 Length mm _____
 Width mm _____
 Height mm _____

Coding: Type WBS Silencers

CODE WBS (H or V)
 Plus Variants
 as for type WS

H or V = Bend in Horizontal or Vertical Plane

Example

WBS (H) or (V) M/75-X-X-X-X

Type _____
 Variants _____
 Airways _____
 Width mm _____
 Air entry leg
 Dimension L_1 mm _____
 Air exit leg
 Dimension L_2 mm _____
 Silencer _____
 Width mm _____
 Height mm _____

Type WBSH

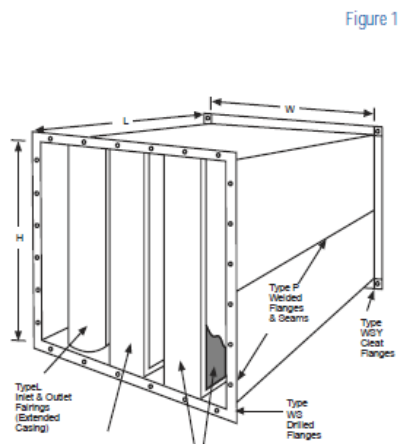
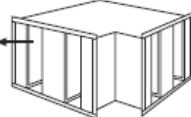


Figure 1

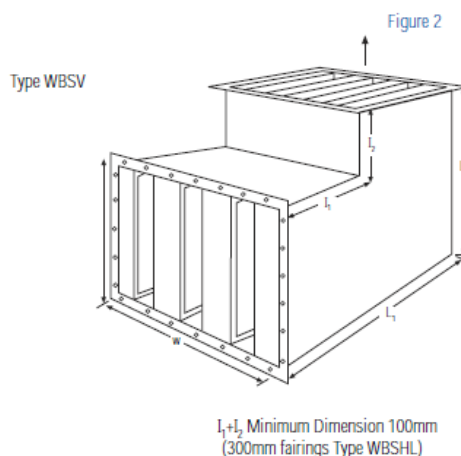


Figure 2

Noise Mitigation Products

Flakt Wood Attenuators

Splitter Silencers

Performance

Type WS/WSY

Intermediate airway widths can be provided to suit individual requirements. Please enquire.

Care should be taken in use of 50mm

Airway Silencer. Perforated Linings are required on airways of 75mm or less. Please enquire.

The following airway velocities should not be exceeded for the ventilation space noise levels tabulated, in order to avoid possible noise regeneration in the silencer.

Airway Velocity=

$$\frac{\text{Volume Flow Rate m}^3/\text{s}}{\text{Number of Airways} \times \text{Airway Width} \times \text{Height (metres)}}$$

TABLE C

Velocity m/s	NC/NR Level
15	45-50
13	35-40
10	30

For special applications please enquire.

Table A

Airways mm	Length mm	Octave Band Mid Frequencies							
		Frequency Hz							
		63	125	250	500	1K	2K	4K	8K
50	600	6	12	22	31	40	40	40	30
	900	8	16	27	45	55	55	55	50
	1200	10	20	36	55	55	55	55	55
	1500	13	24	42	55	55	55	55	55
	1800	15	30	51	55	55	55	55	55
	2100	17	34	55	55	55	55	55	55
	2400	19	38	55	55	55	55	55	55
75	600	5	8	11	24	31	32	24	20
	900	6	11	19	34	45	45	39	28
	1200	7	14	26	46	55	55	52	38
	1500	9	17	30	48	55	55	55	42
	1800	10	20	34	50	55	55	55	46
	2100	12	23	40	55	55	55	55	55
	2400	13	24	45	55	55	55	55	55
100	600	4	7	11	21	31	29	21	20
	900	5	9	16	30	39	39	31	26
	1200	6	12	23	40	51	51	41	29
	1500	8	15	26	43	53	53	45	32
	1800	9	17	30	47	55	55	49	36
	2100	11	20	35	55	55	55	55	43
	2400	12	23	40	55	55	55	55	47
150	600	2	5	8	12	15	15	11	7
	900	3	6	11	20	25	25	15	8
	1200	4	7	15	26	33	33	19	11
	1500	5	9	18	33	41	41	24	13
	1800	6	11	22	39	49	49	29	16
	2100	7	13	26	45	55	55	34	19
	2400	8	15	30	52	55	55	39	21

Type WBS

The value of additional attenuation due to the mitred bend should be deducted from the attenuation required.

To obtain the attenuation, dimensions $L_2 + L_3$ must be equal or greater than 2.5 x height for Type WBSV or 2.5 width for Type WBSH.

Table B

Silencer Height for WBSV or width for WBSH	Additional Attenuation in Octave Bands Hz							
	63	125	250	500	1K	2K	4K	8K
300	0	0	2	8	6	3	3	3
450	0	1	5	7	4	3	3	3
600	0	2	8	6	0	3	3	3
750	0	3	8	5	0	3	3	3
900	0	5	7	4	0	3	3	3
1050	0	7	7	4	0	3	3	3
1200	1	8	6	4	0	3	3	3
1350	2	8	6	3	0	3	3	3
1500	3	8	5	3	0	3	3	3