

22 FEB 2017

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PLANNING NOISE ASSESSMENT

CADOGAN HOUSE, READING

SDA ARCHITECTS LTD

FEBRUARY 2017

22 FEB 2017

PLANNING NOISE ASSESSMENT CADOGAN HOUSE, READING

Our Ref: 3149_001r_2-0_sm_e



Client: SDA Architects Ltd
Manor Mills
Manor Road
Leeds
LS11 9AH

Report by: Anderson Acoustics Limited
3 Trafalgar Mews
15-16 Trafalgar Street
Brighton
East Sussex BN1 4EZ

www.andersonacoustics.co.uk

T: 01273 696887

Date: 20 February 2017

Project No: 3149
Status: ISSUED

Author Sam Martin
Assistant Consultant
BSc (Hons) PGdip

20 February 2017

Reviewed Grant Waters
Consultant
BSc (Hons) BSc AMIOA

20 February 2017

Approved Joe Baggaley
Principal Consultant
BSc (Hons) MSc MIOA

20 February 2017

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REVISION HISTORY

Version	Comments	Changes made by	Approved by
1.0	First issued version	SM	JB
2.0	Second Issued Version	SM	JB

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1 INTRODUCTION

Anderson Acoustics Ltd was commissioned by SDA Architects Ltd in January 2017 to undertake a noise assessment for the proposed development on Cadogan House, Reading.

The development involves the change of use of an existing office space to 19 one bedroom apartments across the ground and first floors.

This assessment has been carried out to provide advice on the control of external noise via the building envelope to safeguard the amenity of future occupants.

Noise units, acoustic terminology and environmental noise criteria relevant to the assessment have been presented and briefly discussed in Section 2 of this report.

2 NOISE UNITS, POLICY AND CRITERIA

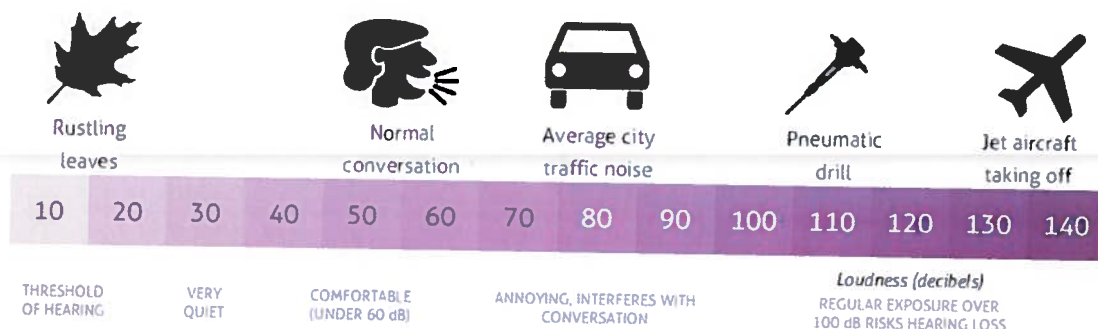
2.1 Noise Units

There is a million to one ratio between the threshold of hearing and the highest tolerable sound pressure. Noise is therefore measured using a logarithmic scale, to account for this wide range, called the decibel (dB). Noise is defined as unwanted sound and the range of audible sound varies from around 0 dB to 140 dB.

The human ear is capable of detecting sound over a range of frequencies from around 20 Hz to 20 kHz, however its response varies depending on the frequency and is most sensitive to sounds in the mid frequency range of 1 kHz to 5 kHz. Instrumentation used to measure noise is therefore weighted across the frequency bands to represent the sensitivity of the ear. This is called 'A weighting' and is represented as dB(A).

It is generally accepted that under normal conditions humans are capable of detecting changes in steady noise levels of 3 dB, whilst a change of 10 dB is perceived as a doubling or halving of the noise level. An indication of the range of noise levels commonly found in the environment is given below.

Figure 2.1: Typical noise levels



A number of different indices are used to describe the fluctuations in noise level over certain time periods. The main indices include:

- $L_{A90,T}$** This is the noise level exceeded for 90% of the measurement period and provides a measurement of the quieter 'lull' periods in between noise events. It is often referred to as the background noise level.
- $L_{Aeq,T}$** This is the "equivalent continuous A weighted sound pressure level" and is the level of a notional steady sound which has the same acoustic energy as the fluctuating sound over a specified time period. It is often used for measuring all sources of noise in the environment, which can be referred to as the ambient noise.
- $L_{Amax,F}$** This is the maximum sound pressure level measured in a given time period with the sound level meter set to 'fast' response.

Reference is often made to acoustic measurements being undertaken in 'free-field' or 'façade' locations. Free-field measurements represent a location away from vertical reflecting surfaces, normally by at least 3.5 metres. A façade measurement is undertaken, or calculated to a position 1 metre from an external façade and a correction of up to 3 dB can be applied to account for the sound reflected from the façade. This latter position is often used when assessing the impact of external noise affecting residents inside properties.

2.2 Noise Policy and Criteria

2.2.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) [1] was published on 15 March 2010. It sets out the long term vision of the Government's noise policy, which is to promote good health and a good quality of life through the management of noise within the context of sustainable development. The NPSE sets out the following aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life."

The NPSE describes a number of effect levels that may be used to define effects in the context of noise policy, as follows:

- **NOEL – No Observed Effect Level** - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- **LOAEL – Lowest Observed Adverse Effect Level** - This is the level above which adverse effects on health and quality of life can be detected.
- **SOAEL – Significant Observed Adverse Effect Level** - This is the level above which significant adverse effects on health and quality of life

In March 2014 further guidance on interpreting the effect levels was published on the Government's Planning Practice Guidance. This includes a table that summarises noise exposure hierarchy, noting this is based on the likely average response of a population. This table is reproduced in Table 2.1 overleaf.

Table 2.1 Noise exposure hierarchy and effect levels

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.2.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF) [2] was published on 27 March 2012. Along with the introduction of this document, a number of detailed planning policy guidance notes were withdrawn, including PPG24, on planning and noise.

The NPPF sets out how the Government's planning policies should be applied. In terms of the detail of policies on environmental issues such as noise, the intention is for Local Planning Authorities to set their own guidance. This will form part of or be referred to in the relevant Local Plan.

Reading Borough Council does not currently provide any specific planning policies for external noise ingress for residential developments.

2.3 Relevant Guidance

2.3.1 British Standard 8233

British Standard BS 8233: 2014: Sound insulation and noise reduction for buildings – Code of practice [3] provides guideline values for internal noise levels within a number of building types including residential dwellings.

Values for good and reasonable indoor noise levels are outlined in BS 8233 and are reproduced in Table 2.2.

Table 2.2: British Standard 8233 Indoor Noise Levels

Activity	Location	Daytime	Night-time
Resting	Living room	35 dB $L_{Aeq, 16\text{hour}}$	-
Dining	Dining room/area	40 dB $L_{Aeq, 16\text{hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16\text{hour}}$	30 dB $L_{Aeq, 8\text{hour}}$

Notes: Daytime assessment period – 07:00 to 23:00 hrs
Night-time assessment period – 23:00 to 07:00 hrs

BS 8233 also provides guidance on calculating the sound insulation performance requirements for the external envelope or facade of a building where this is made up of a number of different elements.

2.3.2 World Health Organisation Guidelines

The following guideline values for community ambient noise levels in specific environments are presented in the World Health Organization (WHO) Guidelines for Community Noise [4], shown in Table 2.3 below.

Table 2.3: WHO Guideline Noise Values

Specific Environment	Critical Health Effect(s)	dB $L_{Aeq,T}$	Time Base hours	dB $L_{Amax,F}$
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outdoor amenity	annoyance, daytime and evening	50-55	16	-

The 45 dB $L_{AF,max}$ 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 the level that should not be exceeded for ninety percent of the "single sound events" throughout a night time period.

2.3.3 Summary of environmental noise criteria

Having considered the above criteria a design limit of 35 dB $L_{Aeq,T}$ is to be achieved in living rooms and 30 dB $L_{Aeq,T}$ in bedrooms at night. In addition, individual noise events should not normally exceed 45 dB $L_{AF,max}$ within bedrooms at night.

3 SITE DESCRIPTION

3.1 Existing Site

The site location is shown in Figure 3.1 , and is currently known as Cadogan House, Rose Kiln Lane, Reading RG2 0HP.

The development is located in between Rose Kiln Lane and the A33 and is surrounded by several other commercial premises.

Figure 3.1: Development location in relation to surroundings



External walls are constructed of solid brickwork (assumed 225 mm thick) with double glazed windows and separating floors of solid concrete slab (assumed to be 150 mm thick). Offices are currently located on both the ground and the first floor.

Observations during the site visits indicated that the noise climate across the entire site was governed by road traffic on Rose Kiln Lane to the west of the site, and road traffic on the A33 to the east of the site. Noise from commercial premises surrounding the site was deemed to be of minor noise contribution compared to nearby road traffic noise.

3.2 Proposed Development

The development involves the change of use of an existing office space to 19 one bedroom apartments across the ground and first floors.

Proposed floor plans are not yet available at this stage of the project.

4 NOISE MEASUREMENTS

4.1 Noise Survey

4.1.1 Methodology

Due to lack of a secure on site location unattended measurements for an extended period of time were not possible.

To gather noise levels incident on the site, attended measurements were undertaken in accordance with the CRTN shortened methodology (calculation of traffic noise) [5].

This involved recording noise levels of 15 minute duration to the front and rear of the existing building over three consecutive hours between 10:00 hrs and 17:00 hrs for day time measurements, and over 2 consecutive hours between 00:00 hrs and 02:00 hrs for night time measurements. The attended measurement locations are shown in Figure 4.1 below. Noise levels were measured using a 01dB Duo sound level meter. The microphone was fitted with a weatherproof windshield and fixed to a tripod approximately 1.8 m above ground floor level.

The equipment was calibrated before and after the survey using a 01dB Cal 21 sound calibrator to generate a calibration level of 94.0 dB at 1 kHz. No significant calibration drifts were observed.

Table 4.1: Site Location and Monitoring Positions



4.1.2 Weather Conditions

During attended measurements the weather conditions were observed to be dry with negligible wind. It is considered that the weather conditions did not significantly adversely affect the noise measurements.

4.1.3 Results

Table 4.1 shows the results of the measurements carried out at the attended positions, for each measurement position, the $L_{A10,15min}$ and $L_{Aeq,15min}$ noise levels have been presented.

Table 4.1: Daytime Attended Survey Results

Ref	Position	Time	Duration mins	L_{Aeq} dB	L_{A10} dB	Dominant Source
A1	Rear façade	12:08	15	64	67	Road traffic noise on Rose Kiln Lane and A33
A2	Front façade	12:41	15	74	77	
A1	Rear façade	13:00	15	65	68	
A2	Front façade	13:27	15	74	78	
A1	Rear façade	14:00	15	64	67	
A2	Front façade	14:18	15	74	77	

The CRTN shortened method calculates the 18-hour daytime period by using measurements of L_{A10} made over three consecutive hours, results shown in Table 4.2 below.

Table 4.2: Daytime noise level calculated using CRTN method

Ref	Position	Day-time (07:00 to 23:00 hrs) $L_{A10,18hr}$ dB
A1	Front façade	76
A2	Rear Façade	66

There is no shortened method for night-time assessments. However, it is accepted that the logarithmic average of measurements undertaken during the first or last 3 hours of the night provides a good approximation of the L_{Aeq} which occurs over the 8 hour night-time period. Typically, the noise levels at each end of the night-time period are loudest. Therefore, this method provides a worst-case scenario. Accordingly, sample measurements were undertaken for representative sample periods within the first 3 hours of the night time period from 00:00 to 02:00 hours. The monitored noise levels are presented table 4.3.

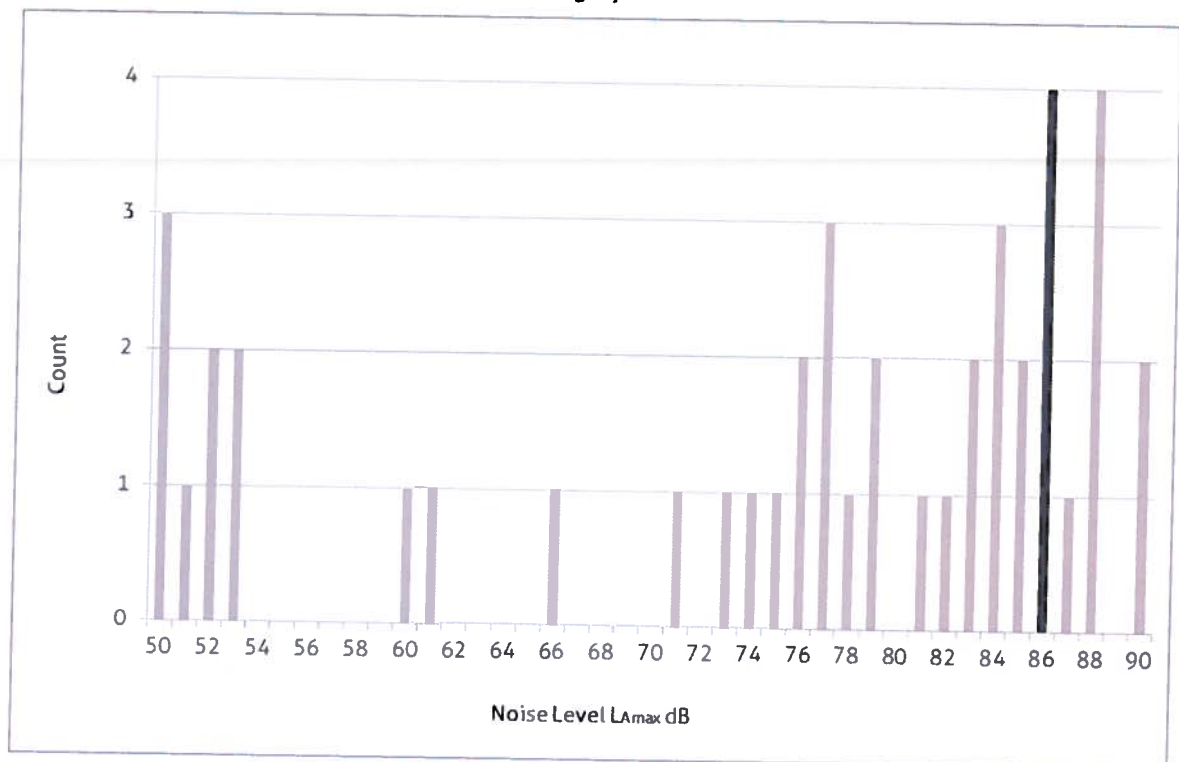
Table 4.3: Night Time Attended Survey Results

Ref	Position	Time	Duration mins	L _{Aeq} dB	Dominant Source
A1	Front façade	00:00	15	67	Road traffic noise on Rose Kiln Lane and A33
A2	Rear façade	00:16	15	58	
A1	Front façade	01:00	15	61	
A2	Rear façade	01:17	15	59	
A1	Front façade	02:00	15	70	

The results indicate average (façade) night-time ambient noise levels of 68 dB L_{Aeq} for the west facing façade and 59 dB L_{Aeq} for the east façade.

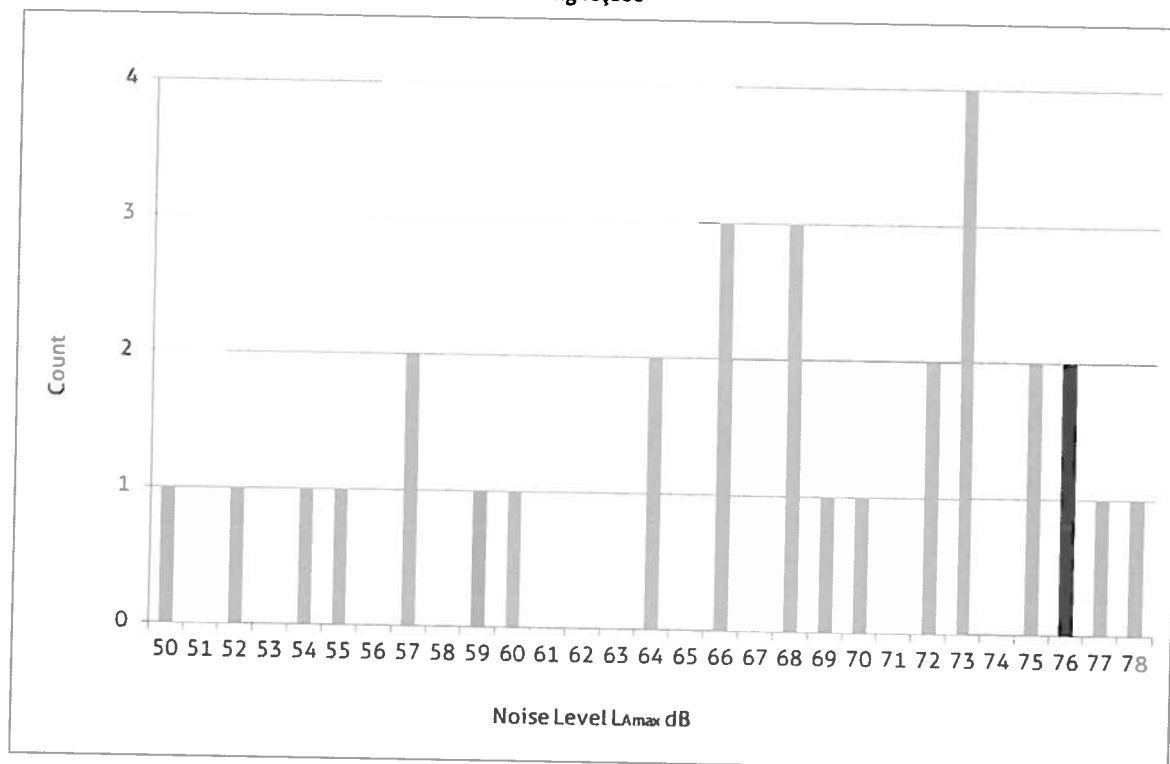
Figure 4.2 and 4.3 below present the frequency of maximum night-time noise events for the west and east facing façades. The data has been assessed using 1 minute data from the night time attended noise measurements.

Figure 4.2: Distribution of L_{Amax} noise events for West facing façade



Regular high level events were measured to be incident on the west site boundary. As can be seen in Figure 4.2, maximum L_{Amax} events up to 90 dB occur and observations on site indicate that they were caused by road vehicle pass-bys. It was also observed that a loose drain cover caused increased sound levels as vehicles passed on some occasions. In order to best represent typical noise events, and to avoid design to the 'worst case' events, the top 10% of maximum events have been omitted from the façade calculations, this results in a level of 86 dB L_{Amax} highlighted above.

Figure 4.3: Distribution of L_{Amax} noise events for East facing façade



Again for the east facade, the top 10% of maximum events have been omitted from the façade calculations resulting in a level of 76 dB L_{Amax} highlighted above. The maximum levels were caused by vehicle pass-bys on A33 and can be seen to be lower than those at the west facade due to increased distance from the roadside.

5 PREDICTED INTERNAL NOISE LEVELS

In order to assess the requirements for window and ventilation it is necessary to estimate internal noise levels with windows closed using standard glazing and ventilation products.

Calculations have been made in accordance with BS 8233:2014 and BS EN 12354-3:2000. The area of glazing and method of ventilation in any particular room, along with the room size and room acoustic conditions, affect the degree of reduction in noise transmission from outside to inside.

Details of glazed areas and room dimensions have not been made available prior to the issue of this report and therefore some generic assumptions have been made. Calculations should be refined when specific dimensions are known during later design stages.

A full list of calculation assumptions is shown in Appendix B.

Full spectral calculations are provided in Appendix B.

Details of the recommended performance requirements of the windows and ventilators are given in Table 5.1 and 5.2 for west and east facing rooms respectively, along with indicative specifications.

Table 5.1: Glazing and ventilation performance requirements– West facing

Room	Performance Requirements				Comments
	Window Units		Ventilators		
West facing rooms	R_w	$R_w + C_{tr}$	$D_{n,e,w}$	$D_{n,e,w} + C_{tr}$	
Bedrooms	46	39	46	43	A double glazing unit such as SG Phonip 9/20/11mm glazing with laminate and an acoustic passive ventilator with the specified performance should provide the minimum performance requirements.
Living Rooms	42	37	46	43	A double glazing unit such as SG Phonip 9/12/10mm glazing with laminate and an acoustic passive ventilator with the specified performance should provide the minimum performance requirements.

*Note: The recommended glazing and ventilation specification for bedrooms have been selected based on the maximum noise levels at night time which were the controlling factor in the façade design.

Table 5.2: Glazing and ventilation performance requirements – East facing

Room	Performance Requirements				Comments
	Window Units		Ventilators		
West facing rooms	R_w	$R_w + C_{tr}$	$D_{n,e,w}$	$D_{n,e,w} + C_{tr}$	
Bedrooms	33	29	37	35	A standard double glazing unit such as 4/12/6mm and an acoustic trickle ventilator with the specified performance should provide the minimum performance requirements.
Living Rooms	33	29	37	35	

*Note: The recommended glazing and ventilation specification for bedrooms have been selected based on the maximum noise levels at night time which were the controlling factor in the façade design.

6 CONCLUSIONS

A noise assessment has been undertaken to assess the impact of noise on the proposed development at Cadogan House, Rose Kiln Lane, Reading RG2 0HP. Site observations indicated that the noise climate around the building was dominated by local traffic on Rose Kiln Lane and the A33.

Noise measurements were undertaken on the site to establish the level of ambient noise incident on the proposed development.

Using the noise data captured, advice has been given on the design of the building envelope to ensure that internal noise levels inside habitable rooms lie within guideline limits recommended in WHO and BS8233:2014.

The required sound insulation performances can be met with acoustic laminate glazing and acoustic trickle ventilators. With these measures in place recommended internal noise levels set out in WHO and BS8233 should be met, and conditions for occupants should equate to No Observed Adverse Effect.

With the above measures in place the change from commercial to residential use will not be an issue in terms of noise ingress from external sources.

7 REFERENCES

- 1 Noise Policy Statement for England (NPSE). 15 March 2010
- 2 National Planning Policy Framework (NPPF). 27 March 2012
- 3 British Standards Institution. Sound Insulation and Noise Reduction for Buildings – Code of Practice. BS 8233: 2014
- 4 World Health Organisation - Guidelines for Community Noise. 2000
- 5 Department of Transport Welsh Office. Calculation of Road Traffic Noise. 1988

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APPENDIX A

FAÇADE NOISE INGRESS CALCULATIONS AND ASSUMPTIONS

The following assumptions have been used for the assessment of the sound insulation requirements of the building envelope:

- › Sound insulation data has been based on both library data and specific manufacturers' data. It has been assumed that the on-site performance will be comparable with manufacturer's claimed performance.
- › The predictions assume good quality workmanship, for example that windows, doors and opening lights are well sealed. Poor workmanship or low quality seals may result in predicted internal noise levels being exceeded.
- › External walls are understood to be of cavity masonry construction with mineral fibre in the cavity.
- › It is understood that the proposed ventilation strategy is for natural ventilation in habitable rooms. The number of ventilators has a substantial influence on the sound insulation of the building envelope. Current guidance on complying with the Building Regulations (Approved Document F) offers many options to provide adequate ventilation. Some of these are more preferable with regards to noise break-in, such as whole house ventilation with heat recovers as no through wall vents are required. Other options require anywhere between 1 and 6 ventilators per room. It has been assumed that there will be 2 no. ventilators in living rooms and 1 no in bedrooms.
- › Room layouts are unknown at this stage therefore generic dimension have been assumed, shown in the Table below:

Room layout assumptions

Dimension	Living Room	Bedroom
Volume (m ³)	45	25
Glazing Area (m ²)	5	2
External wall area (m ²)	5	7
No. ventilators	2	1

The sound insulation requirements of the glazing are applicable to the window system as a whole, including frames, mullions and panels. They are based on BS EN ISO 140-3: 1995 "Laboratory measurement of airborne sound insulation of building elements and rated in accordance with BS EN ISO 717-1:2013 Acoustics – Rating of sound insulation in buildings and of building elements Part 1. Airborne sound insulation".

For unit ventilators, the measurements are based on BS EN ISO 140-10: 1995 Laboratory measurement of airborne sound insulation of small building elements and rated in accordance with BS EN ISO 717-1:1997 "Acoustics – Rating of sound insulation in buildings and of building elements Part 1. Airborne sound insulation".

Table B1: Living Room Daytime (West façade overlooking Rose Kiln Lane) – L_{eq}

Job name: Cadogan House, Reading
Job no.: 3149
Façade: Living Room Daytime (West)

RESULT SUMMARY:

Predicted Internal Level: **34** dB $L_{Aeq,T}$
Criterion: **35** dB $L_{Aeq,T}$
Difference: **-1** dB $L_{Aeq,T}$

SOUND INSULATION BY ELEMENT

Formula Description

Data Units

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

Reverberation Time

Receiver Room Volume

0.5	0.5	0.5	0.5	0.5	0.5
-----	-----	-----	-----	-----	-----

45 m³

Element 1

L1	Wall (database)	
-R	Façade	Leq
+10logS	Brick-block cavity wall	
-10logA	Element Area	5 m ²
+0	where A=0.16V/T	
=L2		0
L2tot	Running total	

67	68	68	73	70	64	76
41	45	45	54	58	58	52 Rw
7	7	7	7	7	7	48 Rw+Ctr
12	12	12	12	12	12	
0	0	0	0	0	0	
21	18	19	15	7	2	19
21	18	19	15	7	2	19

Element 2

L1	Window (database)	
-R	Façade	Leq
+10logS	SG Phonip 9/12/10mm	
-10logA	Element Area	5 m ²
+0	where A=0.16V/T	
=L2		0
L2tot	Running total	

67	68	68	73	70	64	76
30	30	39	44	48	51	42 Rw
7	7	7	7	7	7	37 Rw+Ctr
12	12	12	12	12	12	
0	0	0	0	0	0	
32	33	25	25	17	9	29
32	33	25	25	18	10	30

Element 3

L1	Ventilator (database)	
-R	Façade	Leq
+10logSo	Renson AK43 - Acoustic trickle vent	
-10logA	Reference Area	20 m ²
+0	where A=0.16V/T	
=L2		0
L2tot	Running total	

67	68	68	73	70	64	76
34	40	44	46	48	52	46 Dnew
13	13	13	13	13	13	43 Dnew+Ctr
12	12	12	12	12	12	
0	0	0	0	0	0	
34	29	26	29	23	14	32
36	35	29	31	24	15	34

Table B2: Bedroom Night time (West façade) – L_{Amax}

Job name: Cadogan House, Reading
 Job no.: 3149
 Façade: Bedroom Night-time Max (West)

RESULT SUMMARY:

Predicted Internal Level: **44** dB L_{Amax}
 Criterion: **45** dB L_{Amax}
 Difference: **-1** dB L_{Amax}

SOUND INSULATION BY ELEMENT

Formula Description

Data Units

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

Reverberation Time

Receiver Room Volume

25 m³

s 0.5 0.5 0.5 0.5 0.5 0.5

Element 1

L1 Wall (database) Façade Lmax

-R Brick-block cavity wall

+10logS Element Area 7 m²

-10logA where A=0.16V/T

+0 0

=L2

L2tot Running total

74	79	81	84	81	70	
41	45	45	54	58	58	86
8	8	8	8	8	8	52 Rw 48 Rw+Ctr
9	9	9	9	9	9	
0	0	0	0	0	0	
32	33	35	30	22	12	35
32	33	35	30	22	12	35

Element 2

L1 Window (database) Façade Lmax

-R SG Phonip 9/20/11 SG Phonip

+10logS Element Area 2 m²

-10logA where A=0.16V/T

+0 0

=L2

L2tot Running total

74	79	81	84	81	70	
27	37	44	51	50	53	86
3	3	3	3	3	3	46 Rw 39 Rw+Ctr
9	9	9	9	9	9	
0	0	0	0	0	0	
41	36	31	27	25	11	34
41	38	36	32	27	15	37

Element 3

L1 Ventilator (database) Façade Lmax

-R Renson AK43 - Acoustic trickle vent

+10logSo Reference Area 10 m²

-10logA where A=0.16V/T

+0 0

=L2

L2tot Running total

74	79	81	84	81	70	
34	40	44	46	48	52	86
10	10	10	10	10	10	46 Dnew 1 Dnew+Ctr
9	9	9	9	9	9	
0	0	0	0	0	0	
40	39	38	40	34	19	42
44	42	40	40	35	21	44

Table B3: Living Room Daytime (East façade) – L_{eq}

Job name: Cadogan House, Reading
 Job no.: 3149
 Façade: Living Room Daytime (East)

RESULT SUMMARY:

Predicted Internal Level: **33** dB $L_{Aeq,T}$
 Criterion: **35** dB $L_{Aeq,T}$
 Difference: **-2** dB $L_{Aeq,T}$

SOUND INSULATION BY ELEMENT

Formula Description

Data Units

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

Reverberation Time

0.5	0.5	0.5	0.5	0.5	0.5
-----	-----	-----	-----	-----	-----

Receiver Room Volume

45 m³

Element 1

Wall (database)

L1

Façade

Leq

-R

Brick-block cavity wall

+10logS

Element Area

5 m²

-10logA

where A=0.16V/T

+0

0

=L2

L2tot

Running total

62	60	60	64	59	51	66
41	45	45	54	58	58	52 Rw
7	7	7	7	7	7	48 Rw+Ctr
12	12	12	12	12	12	
0	0	0	0	0	0	
17	10	10	5	-4	-11	11
17	10	10	5	-4	-11	11

Element 2

Window (database)

L1

Façade

Leq

-R

SGG 4/12/6mm

+10logS

Element Area

5 m²

-10logA

where A=0.16V/T

+0

0

=L2

L2tot

Running total

62	60	60	64	59	51	66
23	22	27	38	40	41	33 Rw
7	7	7	7	7	7	29 Rw+Ctr
12	12	12	12	12	12	
0	0	0	0	0	0	
35	33	28	21	14	6	29
35	33	28	21	14	6	29

Element 3

Ventilator (database)

L1

Façade

Leq

-R

Renson AK35 - Acoustic trickle vent

+10logSo

Reference Area

20 m²

-10logA

where A=0.16V/T

+0

0

=L2

L2tot

Running total

62	60	60	64	59	51	66
29	30	37	39	36	42	37 Dnew
13	13	13	13	13	13	35 Dnew+Ctr
12	12	12	12	12	12	
0	0	0	0	0	0	
35	32	24	26	25	11	31
38	36	30	28	25	12	33

Table B4: Bedroom Room Night-time (East façade) – L_{Amax}

Job name: Cadogan House, Reading
Job no.: 3149
Façade: Bedroom Night-time Max (East)

RESULT SUMMARY:

Predicted Internal Level: **44** dB L_{Amax}
Criterion: **45** dB L_{Amax}
Difference: **-1** dB L_{Amax}

SOUND INSULATION BY ELEMENT

Formula Description

Data Units	Octave band centre frequency, Hz						
	125	250	500	1000	2000	4000	dB(A)

Reverberation Time	s	0.5	0.5	0.5	0.5	0.5	0.5
Receiver Room Volume	m^3	25					

Element 1

L1	Wall (database)	
-R	Façade	L_{max}
	Brick-block cavity wall	
+10logS	Element Area	$7 m^2$
-10logA	where $A=0.16V/T$	
+0		0
=L2		
L2tot	Running total	

72	73	73	75	67	63	
41	45	45	54	58	58	76
8	8	8	8	8	8	52 Rw 48 Rw+Ctr
9	9	9	9	9	9	
0	0	0	0	0	0	
30	28	28	20	9	4	27
30	28	28	20	9	4	27

Element 2

L1	Window (database)	
-R	Façade	L_{max}
	SGG 4/12/6mm	
+10logS	Element Area	$2 m^2$
-10logA	where $A=0.16V/T$	
+0		0
=L2		
L2tot	Running total	

72	73	73	75	67	63	
23	22	27	38	40	41	76
3	3	3	3	3	3	33 Rw 29 Rw+Ctr
9	9	9	9	9	9	
0	0	0	0	0	0	
43	45	40	30	21	16	41
43	45	41	31	21	16	41

Element 3

L1	Ventilator (database)	
-R	Façade	L_{max}
	Renson AK35 - Acoustic trickle vent	
+10logSo	Reference Area	$10 m^2$
-10logA	where $A=0.16V/T$	
+0		0
=L2		
L2tot	Running total	

72	73	73	75	67	63	
29	30	37	39	36	42	76
10	10	10	10	10	10	37 Dnew i Dnew+Ctr
9	9	9	9	9	9	
0	0	0	0	0	0	
44	45	38	37	32	22	42
47	48	42	38	33	23	44