

JOSTEC

BUILDING REGULATIONS COMPLIANCE SERVICES



PROJECT TITLE: CLADDING SURVEY AND CLADDING ACCESSORY
SCHEME OF NOTICE INITIATION MEASURES FOR
RESIDENTIAL DEVELOPMENT AT
5-

REPORT REFERENCE : 2174004

ISSUED TO: VVAA/ELIC
THE KEEN PARTNERSHIP
THE COL
EDINBURGH ROAD
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ISSUED BY: JOSTEC

DATE: 11 February

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- A noise survey and assessment has been carried out by Jostec for 72 hours in accordance with BS 6841:2014 "Guidance on Sound insulation and noise criteria for buildings".
- The noise assessment is to be submitted to Reading Borough Council as part of the planning application.
- Day and night period noise to the development site includes contributions from road and rail traffic.
- The development site is not exposed to exceptionally high overall noise levels throughout the day or night periods.
- A scheme of noise insulation measures is established to ensure that noise levels within the development comply with criteria set with reference to British Standard BS 8233:2014 "Guidance on Sound insulation and noise criteria for buildings".
- Details of the noise survey, assessment and scheme of noise insulation measures are included in the planning application, including sound reduction index calculation of the overall residential building envelope.

1 INTRODUCTION

JosTec has been commissioned to undertake a noise survey and assessment for a proposed residential development at 5-77 London Street in

1.1 Aims

A noise assessment of the proposed development including acoustic performance for design purposes is proposed to protect future residents of the development from external noise, which includes primarily road traffic noise from adjacent surrounding roads. The assessment will include a noise survey and an assessment of the sound insulation of the proposed development.

- Description of the development
- Review of relevant criteria,
- Details of noise survey including subjective observations;
- Noise assessment
- Assessment of scheme of noise insulation measures.

2 DESCRIPTION

The development site is located in the town centre and is bordered by 5-27 London Street to the west and East Street at the rear (east). The area comprises mostly residential dwellings and with a small number of commercial / retail businesses at ground floor level on London Street.

The development is a ground floor conversion of a listed townhouse fronting London Street to three residential flats and construction of two three-storey buildings providing twelve flats towards the rear and East Street. Site / location plan and drawings of the proposed development are included in Appendix A.

Overall noise levels to the site are moderate to high at the front of the development coming principally or contributions from traffic on 5-27 London Street and notably lower towards the rear of the development with less shielding from buildings. Noise sources and sources are provided in section 4.3 of this report.

3 NOISE LIMIT CRITERIA

Officers in Reading Borough and other local authorities have approved and employed the same noise levels given in BS 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'. BS 8233 is considered appropriate for use in this assessment.

Guidance in BS8233 Internal ambient noise levels for dwellings Table 4 states that noise levels to inside residential dwellings do not exceed the guideline values shown below in Table 1:

Activity		Day period	23:00 to 07:00 (night period)
Living	Living room	$L_{Aeq,T} L_{Amax} + 5$ hour	
Dining	Dining room / Kitchen	$L_{Aeq,T} L_{Amax} + 5$ hour	
Sleeping (daytime rest)	Bedroom	$L_{Aeq,T} L_{Amax} + 5$ hour	$L_{Aeq,T} L_{Amax} + 5$ hour

Table 1: Indoor ambient noise levels

Note 4 to Table 4 in Section 7.7.2 of BS8233 additionally states that individual noise events can cause sleep disturbance. This guidance relates principally to night time noise levels. L_{Afm} is the maximum sound level during the night.

BS8233:2014 does not however provide an numerical guidance on night time L_{Afm} into bedrooms - the previous L_{Amax} limit guidance for bedrooms in BS8233:1999 is removed from BS8233:2014. Notwithstanding this and in keeping with World Health Organisation Noise Guide the noise assessment in this report includes the BS8233:1999 criterion of L_{Afm} for the night period.

The L_{Amax} criterion is applied on the basis that noise events should not regularly exceed L_{Amax} and that the $L_{Aeq,T}$ is more applicable to infrequent night period very high noise level events such as the sirens of passing emergency vehicles.

Guidance from BS 8233 states that noise levels in amenity spaces such as private / semi-private residential gardens, patios balconies and similar during the day period (07:00-23:00) as $L_{Aeq,T}$ values are given below in Table 2:

Guideline		Day period
Desired	Amenity Spaces	$L_{Aeq,T} L_{Amax} + 5$ hour
Maximum	Amenity Spaces	$L_{Aeq,T} L_{Amax} + 5$ hour

Table 2: External ambient noise levels for dwellings

NOISE SURVEY & ASSESSMENT

In order to assess the proposed noise insulation measures proposed for development it is necessary to determine day and night period noise levels at representative positions. Details of the noise survey carried out by JOSTEC are provided in the following sections.

4.1 Noise Survey Procedure

A noise survey has been carried out at the development site using a logging type sound level meter from Monday 7th to Friday 11th January 2022. The following sections describe the methodology used for the survey and the night readings of the survey.

An arbitrary long term measurement position was selected at the rear of the development as indicated on the site plan given in Appendix A. This position was achieved by positioning the measurement equipment on a raised arrangement in the ground level to avoid ground level sound pressure levels.

Measurements were recorded in terms of continuous 5 minute samples of principally road traffic noise. L_{Aeq} and L_{Afm} values were recorded over the duration of the survey.

4.2 Noise

Details of the instrumentation used for the noise survey are provided in Appendix B. The sound level meter was calibrated before and after measurements.

4.3 Noise Survey Results & Observations

Figure 3: Summary noise levels for day and night periods

Overall noise levels rise steadily from early morning to midday where they reach their highest until the late evening/night. Levels are at their lowest between approximately 02

24-hour term measurements indicate noise levels to be between 10-20c higher at the front of the development overlooking A327 London Street compared to the rear of the development overlooking East Street and the rear of the street.

In order to represent worst-case scenario potentially highest noise levels at the front of the development overlooking A327 London Street, measured 24-hour period noise levels to East Street are adjusted by +20dB for the proposed development schemes for noise insulation measures in Section 5.

Results of the 24-hour noise survey are provided in graphical format in Appendix C. Summary highest day and night period free-field L_{Aeq} and typical highest period L_{max} results for the noise survey duration at the rear of the development and adjacent to A327 London Street of the development are shown in Table 3.

Location	24-hour L_{Aeq} 07:00-23:00	Day period L_{max} 07:00-19:00	Night period L_{Aeq} 19:00-07:00
East Street	51.6dB	41.1dB	57.9dB
London Street	71.6dB	61.1dB	60.9dB

Table 3: Summary noise levels for day and night periods

4.4 Noise Impact Assessment

It can be seen from Table 3 that day and night period levels are moderate to low. The area and noise are not high. The site is suitable for the proposed development providing that an appropriate specification of noise insulation is included in the design of the building.

4 as detailed in Section 3.

NOISE INSULATION MEASURES

For this development the scheme of noise insulation measures to protect against noise

elements of the building envelope which includes the external walls, glazing, ventilators and roof / ceiling structures.

The external walls and roof / ceiling structures to the development will by default provide a relatively high level of noise insulation and therefore no further residential ventilation.

By following the design calculation process (Informative) of British Standard BS 8233:2014 a specification for acoustic performance has been achieved. A summary of the noise insulation measures for the whole development building envelope is provided item by item in Sections 3.1 to 3.4 on the following pages. Assessment of noise levels to external amenity spaces of the development is provided in Section 3.5.

Acoustic calculations are provided to demonstrate a noise intrusion into the living room / kitchen space and bedroom 1, selected as representing worst case scenario rooms with the highest ratio of glazing to masonry, roof / ceiling system and so forth, at the potentially highest incident noise levels. The calculations are provided in Appendix A.

The calculations use a spreadsheet calculation (Informative) of British Standard BS 8233:2014 and BS EN 12354-1. This form of spreadsheet is used by many acoustic engineering practices.

The minimum internal with the highest noise level used for the development comply with the values in Section 3.1. In addition, noise levels of the development with BS8233:2014 values defined in Table 2.

1 External Walls

Walls of the development are understood to vary in construction quality, masonry to the top of a parapet wall at East Street a draught excluder is to be fitted to the existing London cladding and with a plasterboard finish inside.

Location	Octave band Centre frequency (Hz)					
	Sound Reduction Index $R_{w,T}$					
	125	250	500	1000	2000	4000
East Street: Cavity masonry insulated with masonry	41	44	49	51	50	60
London Street: traditional solid 9" thick	29	44	41	8	2	0

Table 4 External wall sound insulation performance

5.2 Glazing

Values in Table 5 below are the minimum specification for standard double glazed windows and glazed exterior doors.

Description	Octave band Centre frequency (Hz)					
	Sound Reduction Index $R_{w,T}$					
	125	250	500	1000	2000	4000
East Street: Standard 4 air space 4 double glazing $\leq R_{w,T} 20dB$	17	17	5	3	3	25
London Street: Acoustic performance 8 - 10 dB Double glazed $\geq R_{w,T} 40dB$	29	44	41	8	3	6

Table 5 Sound insulation performance

5.3 Ventilation

It is anticipated that a ventilation system will be designed such that residents of the property are able to have background ventilation without necessarily needing to open windows.

This is best achieved through the use of passive type trickle ventilators in locations that are not subject to especially high noise. The specification for passive trickle ventilators for all parts of the development is detailed in Table 6 below:

Description	Octave band Centre Frequency (Hz)					
	Sound Reduction Index $R_{w,T}$ dB					
	5	250	500	1k	2k	4k
Part Street: Trickle ventilator Minimally $\geq D_{n,w}$ 30dB	3	30	3	2	2	8
London Street: High acoustic performance door, Minimally $\geq D_{n,w}$ 29dB	28	26	24	21	19	14

Table 6: Specification for ventilator sound insulation performance

5.4 Roof Structure & Associate

The roof structure and external cladding of the proposed external area is to be constructed using pitched timber frame and insulated with plasterboard ceilings and solid plaster finish. The values in Table 7 below show suggested minimum sound insulation performance for the construction.

Description	Octave band Centre Frequency (Hz)					
	Sound Reduction Index $R_{w,T}$ dB					
	5	250	500	1k	2k	4k
Part Street: Standard half pitched timber insulated gable roof	27	27		20		21

Table 7: Roof & ceiling sound insulation performance

5.3 Amenity Space

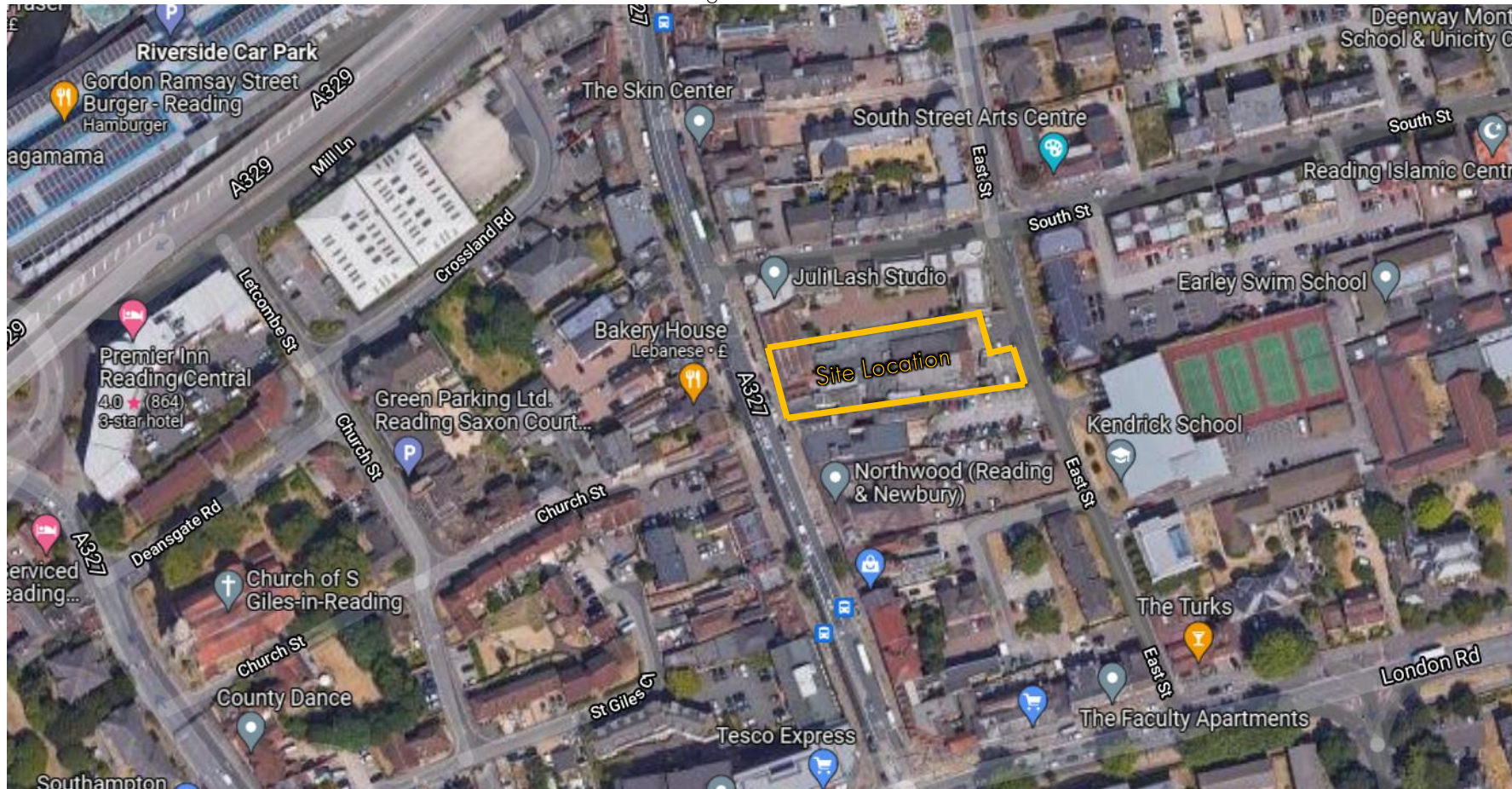
External amenity spaces for the proposed development are principally garden or terrace area rear of the development, consistent with street and side street frontage to the street.

Noise survey results in Section 4, Table 1 show existing day period noise levels to the development. $L_{Aeq,1hr}$ 51 dBA.

The noise survey results therefore indicate that noise levels comply with the upper limit of 55 dBA $L_{Aeq,1hr}$ 58.233:2014 as shown in Section 3, Table 1.

APPENDIX A

Image 5 - Location Plan



So: Die Wirtin ist ein Individuum



- NEW BUILD FLATS - 12 FLATS TOTAL:

Ground Floor 2x 3b5p / 2x 2b4p
First Floor 4x 2b4p
Roof 4x 2b3p

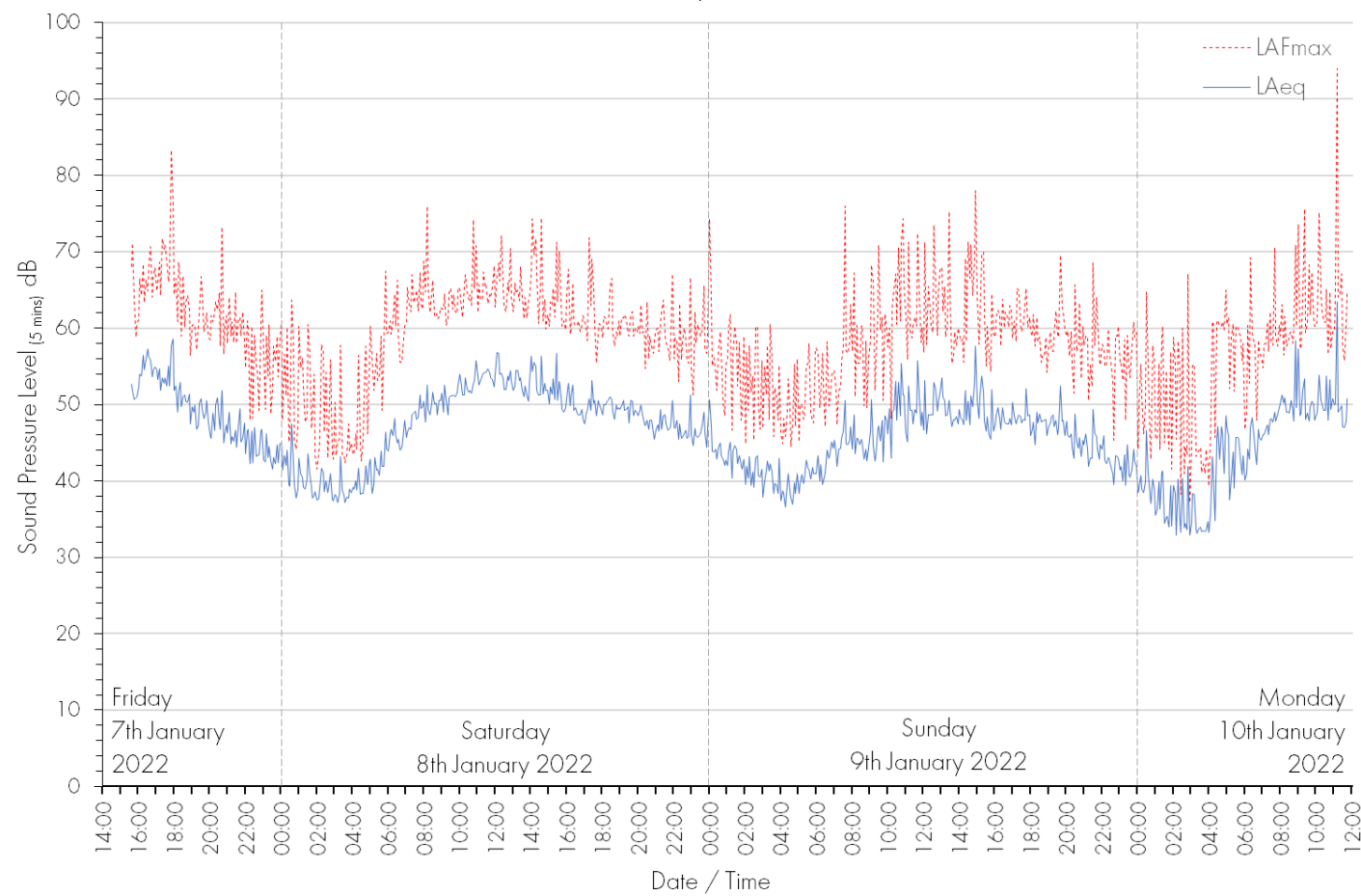
	THE KEEN PARTNERSHIP	Author by <i>John G. Keen</i>
ISBN: 0-07-030303-0 Binding: Hb, 272 pp, 1992 Title: THE KEEN PARTNERSHIP	Wiley 605 Third Avenue, New York, NY 10158-1599 Tel: 212 850 6600 Fax: 212 850 6601 Telex: 212 850 6601 Cable: 212 850 6601	Editorial Title: ISBN: 0-07-030303-0 Date: Date input: Date: (15 November 1992)
City Address: 75-77 London St Reading RG1 1AA	Editorial Reference no: Reviewer Number: G	

B

Instrumentation

- Svanvik Class 1 noise monitoring station model 307 serial number 1000 with integrated preamplifier and A microphone sensitivity 144
- Svanvik calibrator model 3100 serial number 109607

Noise Survey Results



APPENDIX

Building Envelope Acoustic Calculations

BS EN ISO 12354-3 BUILDING ENVELOPE SOUND INSULATION CALCULATION

SAMPLE ROOM : Rear, East Street : Northern Flat 6, Living / Dining Room

NOISE CONDITION : Daytime 16 hour Leq 51.6dBA free field level

Equivalent Free-Field External Sound Pressure Level Outside Sample Room:							
Daytime 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,ff	51.6	53	50	47	48	44	41
Building Envelope Details For Sample Room:							
Element	Area (m ²) or Vent No	Element Specification / Description					
Walls	27.7	Conventional insulated cavity masonry external walls, brick/cavity/wall					
Windows	7.2	4-airgap-4 double glazing ≥ Rw30dB					
Doors	0.0	None to room					
Roof & associated ceiling	26.1	Standard flat/pitched timber joist roof with insulation in loft & plasterboard ceilings					
Ventilators	3	Standard non-acoustic trickle ventilator typically ≥ Dn,e,w 30dB					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m ²) or Vent No	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Walls	27.7	41	45	49	57	60	60
Windows	7.2	17	17	25	35	35	35
Doors	0.0						
Roof & associated ceiling	26.1	27	37	43	49	57	61
Ventilators (Dn,e)	3	30	30	30	30	30	28
Overall Sound Reduction All Elements Combined		-24.3	-25.3	-30.5	-32.7	-32.8	-30.9
Sample Room Volume (m ³):		65.3					
Sample Room Building Envelope Surface Area (m ²):		61.0					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Living Room	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Reverberation Time In Furnished Sample Room		0.40	0.40	0.35	0.30	0.30	0.30
Calculated Internal Sound Pressure Level In Sample Room:							
Daytime 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,2	27.4	35.6	31.0	22.5	20.4	16.2	15.3

APPENDIX D

Building Envelope Acoustic Calculations

BS EN ISO 12354-3 BUILDING ENVELOPE SOUND INSULATION CALCULATION

SAMPLE ROOM : Rear, East Street : Northern Flat 6, Master Bedroom

NOISE CONDITION : Daytime 16 hour Leq 51.6dBA free field level

Equivalent Free-Field External Sound Pressure Level Outside Sample Room:							
Daytime 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,ff	51.6	53	50	47	48	44	41
Building Envelope Details For Sample Room:							
Element	Area (m²) or Vent No	Element Specification / Description					
Walls	5.3	Conventional insulated cavity masonry external walls, brick/cavity/wall					
Windows	4.9	4-airgap-4 double glazing ≥ Rw30dB					
Doors	0.0	None to room					
Roof & associated ceiling	11.6	Standard flat/pitched timber joist roof with insulation in loft & plasterboard ceilings					
Ventilators	2	Standard non-acoustic trickle ventilator typically ≥ Dn,e,w 30dB					
Element Sound Reduction Index:							
Element	Area (m²) or Vent No	dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Walls	5.3	41	45	49	57	60	60
Windows	4.9	17	17	25	35	35	35
Doors	0.0						
Roof & associated ceiling	11.6	27	37	43	49	57	61
Ventilators (Dn,e)	2	30	30	30	30	30	28
Overall Sound Reduction All Elements Combined		-21.9	-22.6	-27.8	-30.0	-30.0	-28.2
Sample Room Volume (m³):		29.0					
Sample Room Building Envelope Surface Area (m²):		21.8					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Bedroom	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Reverberation Time In Furnished Sample Room		0.20	0.20	0.20	0.20	0.20	0.20
Calculated Internal Sound Pressure Level In Sample Room:							
Daytime 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,2	26.7	34.0	29.8	21.8	20.4	16.2	15.3

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Building Envelope Acoustic Calculations

BS EN ISO 12354-3 BUILDING ENVELOPE SOUND INSULATION CALCULATION

SAMPLE ROOM : Rear, East Street : Northern Flat 6, Master Bedroom

NOISE CONDITION : Night-time 8 hour Leq 43.1 dBA free field level

Equivalent Free-Field External Sound Pressure Level Outside Sample Room:							
Night-time 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,ff	43.1	45	41	38	39	35	32
Building Envelope Details For Sample Room:							
Element	Area (m ²) or Vent No	Element Specification / Description					
Walls	5.3	Conventional insulated cavity masonry external walls, brick/cavity/wall					
Windows	4.9	4-airgap-4 double glazing ≥ Rw30dB					
Doors	0.0	None to room					
Roof & associated ceiling	11.6	Standard flat/pitched timber joist roof with insulation in loft & plasterboard ceilings					
Ventilators	2	Standard non-acoustic trickle ventilator typically ≥ Dn,e,w 30dB					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m ²) or Vent No	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Walls	5.3	41	45	49	57	60	60
Windows	4.9	17	17	25	35	35	35
Doors	0.0						
Roof & associated ceiling	11.6	27	37	43	49	57	61
Ventilators (Dn,e)	2	30	30	30	30	30	28
Overall Sound Reduction All Elements Combined		-21.9	-22.6	-27.8	-30.0	-30.0	-28.2
Sample Room Volume (m ³):		29.0					
Sample Room Building Envelope Surface Area (m ²):		21.8					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Bedroom	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Reverberation Time In Furnished Sample Room		0.20	0.20	0.20	0.20	0.20	0.20
Calculated Internal Sound Pressure Level In Sample Room:							
Night-time 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,2	18.2	25.5	21.3	13.3	11.9	7.7	6.8

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Building Envelope Acoustic Calculations

BS EN ISO 12354-3 BUILDING ENVELOPE SOUND INSULATION CALCULATION

SAMPLE ROOM : Rear, East Street : Northern Flat 6, Master Bedroom

NOISE CONDITION : Night-time 8 hour L_{max} 59dBA free field level

Equivalent Free-Field External Sound Pressure Level Outside Sample Room:							
Night-time 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L _{max,ff}	59	61	57	54	55	51	48
Building Envelope Details For Sample Room:							
Element	Area (m ²) or Vent No	Element Specification / Description					
Walls	5.3	Conventional insulated cavity masonry external walls, brick/cavity/wall					
Windows	4.9	4-airgap-4 double glazing ≥ Rw30dB					
Doors	0.0	None to room					
Roof & associated ceiling	11.6	Standard flat/pitched timber joist roof with insulation in loft & plasterboard ceilings					
Ventilators	2	Standard non-acoustic trickle ventilator typically ≥ D _{n,e,w} 30dB					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m ²) or Vent No	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Walls	5.3	41	45	49	57	60	60
Windows	4.9	17	17	25	35	35	35
Doors	0.0						
Roof & associated ceiling	11.6	27	37	43	49	57	61
Ventilators (D _{n,e})	3	30	30	30	30	30	28
Overall Sound Reduction All Elements Combined		-21.6	-22.2	-26.7	-28.4	-28.4	-26.5
Sample Room Volume (m ³):		29.0					
Sample Room Building Envelope Surface Area (m ²):		21.8					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Bedroom	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Reverberation Time In Furnished Sample Room		0.20	0.20	0.20	0.20	0.20	0.20
Calculated Internal Sound Pressure Level In Sample Room:							
Night-time 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
L _{max,2}	35.0	41.7	37.6	30.3	29.5	25.3	24.4

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Building Envelope Acoustic Calculations

BS EN ISO 12354-3 BUILDING ENVELOPE SOUND INSULATION CALCULATION

SAMPLE ROOM : London Street Flat 2, Living / Dining Room

NOISE CONDITION : Daytime 16 hour Leq 51.6dBA free field level

Equivalent Free-Field External Sound Pressure Level Outside Sample Room:							
Daytime 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,ff	51.6	53	50	47	48	44	41
Building Envelope Details For Sample Room:							
Element	Area (m²) or Vent No	Element Specification / Description					
Walls	2.5	Traditional solid 9" brick					
Windows	2.8	4-airgap-4 double glazing ≥ Rw30dB					
Doors	0.0	None to room					
Roof & associated ceiling	0.0	None to room					
Ventilators	2	Standard non-acoustic trickle ventilator typically ≥ Dn,e,w 30dB					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m²) or Vent No	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Walls	2.5	39	44	51	58	63	68
Windows	2.8	17	17	25	35	35	35
Doors	0.0						
Roof & associated ceiling	0.0						
Ventilators (Dn,e)	2	30	30	30	30	30	28
Overall Sound Reduction All Elements Combined		-18.4	-18.4	-22.6	-24.0	-24.0	-22.1
Sample Room Volume (m³):		81.2					
Sample Room Building Envelope Surface Area (m²):		5.3					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Living Room	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Reverberation Time In Furnished Sample Room		0.40	0.40	0.35	0.30	0.30	0.30
Calculated Internal Sound Pressure Level In Sample Room:							
Daytime 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,2	23.5	29.9	26.3	18.8	17.5	13.3	12.5

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Building Envelope Acoustic Calculations

BS EN ISO 12354-3 BUILDING ENVELOPE SOUND INSULATION CALCULATION

SAMPLE ROOM : London Street Flat 2, Master Bedroom, facing on to London Street

NOISE CONDITION : Daytime 16 hour Leq 71.6dBA free field level

Equivalent Free-Field External Sound Pressure Level Outside Sample Room:							
Daytime 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,ff	71.6	73	70	67	68	64	61
Building Envelope Details For Sample Room:							
Element	Area (m²) or Vent No	Element Specification / Description					
Walls	7.1	Traditional solid 9" brick					
Windows	3.9	Acoustic performance 8.4-20-10 1) double glazing ≥ Rw43dB					
Doors	0.0	None to room					
Roof & associated ceiling	0.0	None to room					
Ventilators	2	High acoustic performance ventilator ≥ Dn,e,w 39dB					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m²) or Vent No	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Walls	7.1	39	44	51	58	63	68
Windows	3.9	26	34	41	44	45	54
Doors	0.0						
Roof & associated ceiling	0.0						
Ventilators (Dn,e)	2	38	36	34	41	49	54
Overall Sound Reduction All Elements Combined		-28.9	-32.0	-31.2	-37.9	-44.7	-50.5
Sample Room Volume (m³):		47.3					
Sample Room Building Envelope Surface Area (m²):		11.0					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Bedroom	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Reverberation Time In Furnished Sample Room		0.30	0.30	0.25	0.20	0.20	0.20
Calculated Internal Sound Pressure Level In Sample Room:							
Daytime 16hr (7am - 11pm)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,2	35.0	43.8	37.1	34.3	27.4	16.5	7.9

Building Envelope Acoustic Calculations

BS EN ISO 12354-3 BUILDING ENVELOPE SOUND INSULATION CALCULATION

SAMPLE ROOM : London Street Flat 2, Master Bedroom, facing on to London Street

NOISE CONDITION : Night-time 8 hour Leq 63.2dBA free field level

Equivalent Free-Field External Sound Pressure Level Outside Sample Room:							
Night-time 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,ff	63.2	65	61	58	59	55	52
Building Envelope Details For Sample Room:							
Element	Area (m²) or Vent No	Element Specification / Description					
Walls	7.1	Traditional solid 9" brick					
Windows	3.9	Acoustic performance 8.4-20-10 1) double glazing ≥ Rw43dB					
Doors	0.0	None to room					
Roof & associated ceiling	0.0	None to room					
Ventilators	2	High acoustic performance ventilator ≥ Dn,e,w 39dB					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m²) or Vent No	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Walls	7.1	39	44	51	58	63	68
Windows	3.9	26	34	41	44	45	54
Doors	0.0						
Roof & associated ceiling	0.0						
Ventilators (Dn,e)	2	38	36	34	41	49	54
Overall Sound Reduction All Elements Combined		-28.9	-32.0	-31.2	-37.9	-44.7	-50.5
Sample Room Volume (m³):		47.3					
Sample Room Building Envelope Surface Area (m²):		11.0					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Bedroom	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Reverberation Time In Furnished Sample Room		0.30	0.30	0.25	0.20	0.20	0.20
Calculated Internal Sound Pressure Level In Sample Room:							
Night-time 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Leq,2	26.5	35.3	28.6	25.9	19.0	8.1	-0.6

APPENDIX D

Building Envelope Acoustic Calculations

BS EN ISO 12354-3 BUILDING ENVELOPE SOUND INSULATION CALCULATION

SAMPLE ROOM : London Street Flat 2, Master Bedroom, facing on to London Street

NOISE CONDITION : Night-time 8 hour L_{fmax} 80dBA free field level

Equivalent Free-Field External Sound Pressure Level Outside Sample Room:							
Night-time 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Lfmax,ff	80	82	78	75	76	72	69
Building Envelope Details For Sample Room:							
Element	Area (m ²) or Vent No	Element Specification / Description					
Walls	7.1	Traditional solid 9" brick					
Windows	3.9	Acoustic performance 8.4-20-10 1) double glazing ≥ Rw43dB					
Doors	0.0	None to room					
Roof & associated ceiling	0.0	None to room					
Ventilators	2	High acoustic performance ventilator ≥ Dn,e,w 39dB					
Element Sound Reduction Index:							
		dB at Octave Band Centre Frequency					
Element	Area (m ²) or Vent No	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Walls	7.1	39	44	51	58	63	68
Windows	3.9	26	34	41	44	45	54
Doors	0.0						
Roof & associated ceiling	0.0						
Ventilators (Dn,e)	2	38	36	34	41	49	54
Overall Sound Reduction All Elements Combined		-28.9	-32.0	-31.2	-37.9	-44.7	-50.5
Sample Room Volume (m³):		47.3					
Sample Room Building Envelope Surface Area (m²):		11.0					
Sample Room Characteristics:							
		Reverberation Time (seconds) at Octave Band Centre Frequency					
Sample Room Type:	Bedroom	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Reverberation Time In Furnished Sample Room		0.30	0.30	0.25	0.20	0.20	0.20
Calculated Internal Sound Pressure Level In Sample Room:							
Night-time 8hr (11pm - 7am)	Overall dBA	Linear dB at Octave Band Centre Frequency					
		125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Lfmax,2	43.0	52.1	45.5	42.7	35.8	24.9	16.2