

JOSTEC

BUILDING REGULATIONS COMPLIANCE SERVICES



REPORT TITLE: BS8233:2104 ASSESSMENT OF 20 STONE STREET, GRAVESEND, DA11 0NP

REPORT REFERENCE: 24435

ISSUED TO: Jagjoht
Forma Property

ISSUED BY: JAMES FLITTON

DATE: 16 October 2024

Table of Contents

1. INTRODUCTION
2. DEVELOPMENT DESCRIPTION
3. NOISE ASSESSMENT CRITERIA
4. RESULTS
5. OBSERVATIONS AND FURTHER DISCUSSIONS
6. GLAZING, STRUCTURAL AND VENTILATION REQUIREMENTS
7. FURTHER DISCUSSION AND CONCLUSION

APPENDIX A – ACOUSTIC TERMINOLOGY

APPENDIX B – CERTIFICATES OF CALIBRATION

APPENDIX C – WEATHER CHART

1.0 Introduction

- 1.01 JosTec has been commissioned to undertake a noise impact survey and assessment for 20 STONE STREET, GRAVESEND, DA11 0NP.
- 1.02 The methodology used for this assessment will be BS8233 as this is a newly converted development within the designated area.
- 1.03 The report will assess the site to BS8233:2014 to determine recommendations of acoustic performance of glazing and, if required, ventilation proposals in order for the future dwelling to meet all necessary criteria.

2.0 Development Description

- 2.0.1 The site consists of the conversion of the existing premises from office use into residential dwellings on the first and second floor. The ground floor will remain as office and shop floor space with the basement remaining as the staff canteen.
- 2.0.2 The development lies in a mix of residential, retail and some industrial sites.
- 2.0.3 The main noise source likely to disrupt the inhabitants of the new dwellings is the traffic from Stone Street to the front and also the potential of rail traffic noise from the main Gravesend station to the rear of the development.
- 2.0.4 With the above sources in mind the monitoring took place at the front (towards Stone Street) out of one of the front windows, and one of the rear windows facing towards the main station.

2.1 Locations of Monitors

- 2.1.1 Two Type 1 sound level meter were installed at first-floor level within the existing building. The meters were positioned out of the windows in each case to ascertain the façade levels to the existing building.
- 2.1.2 Figure 1 & 2 shows the area where the monitors were installed.
- 2.1.3 All locations are displayed on site map in figure 3

Figure 1



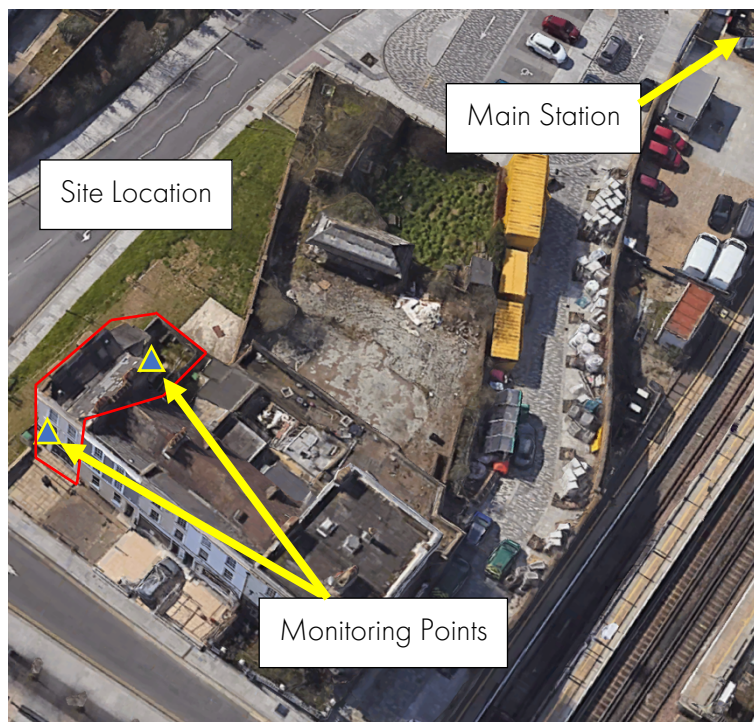
Figure 2



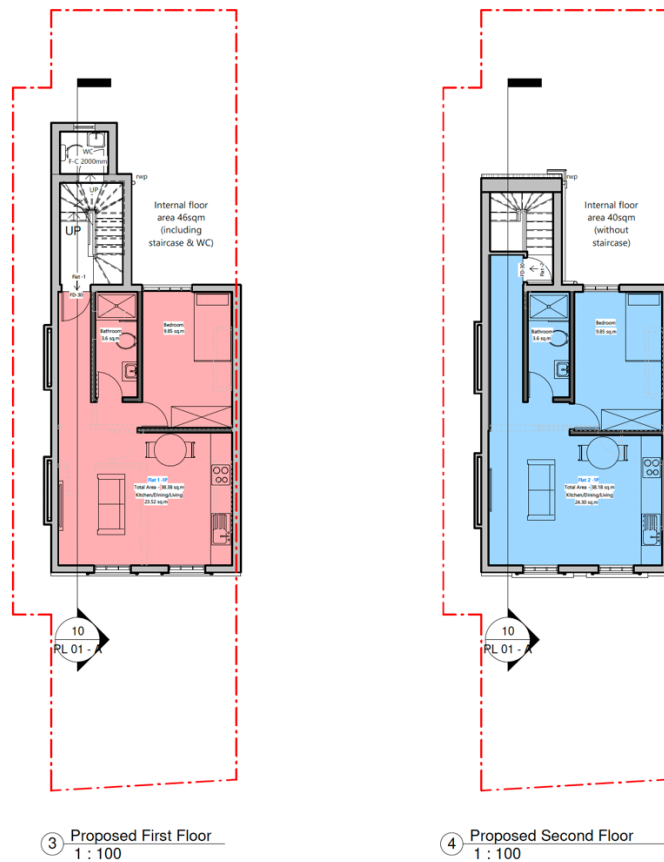
- 2.1.4 Measurements were made in 15 minute periods, on 1 second averaging, to allow for the removal of anomalies and increased accuracy. The data was averaged into $L_{Aeq16hr}$ daytime and L_{Aeq8hr} night-time with data also recorded for L_{AMax} in both day and night periods for the BS8233:2014 assessment.
- 2.1.5 The monitoring was conducted using 2 x Type 1 Svantek 307 sound level meters, outdoor case with batteries and outdoor microphone protection.
- 2.1.6 The measurements were taken by a fully qualified engineer with AMIOA status with the institute of Acoustics.
- 2.1.7 All measurements were taken after a field calibration was undertaken to ensure accuracy and repeatability of measurements. Drift was also checked post measurement to validate the results.
- 2.1.8 Further data such as wind speed, wind direction, rainfall intensity, temperature and cloud cover were all recorded at the beginning and end of the assessment at the monitoring location.
- 2.1.9 Any anomalies (such as noise by the engineer during setup and collection of the kit) were removed from the survey for a true reflection of the ambient levels in the vicinity. This was done by recording audio throughout the survey at each location and listening back through the files during the analysis process to confirm what was recorded manually during the survey.
- 2.2.10 Care was taken to inform any residents in the area that audio recording was taking place.

2.2 Plan Views of Site with Designated Work Areas

Figure 3



2.3 Proposed Site Layout (example floor)



3.0 Noise Assessment Criteria

3.0.1 The National Planning Policy Framework (NPPF) sets out the Government's economic, environmental and social planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 174 of the NPPF states the following:

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

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability."

Paragraph 185 goes on to mention:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health,

living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;”

3.0.2 The NPPF reinforces the March 2010 DEFRA publication, “Noise Policy Statement for England” (NPSE), which states three policy aims, as follows:

“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.”

3.0.3 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

“... all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.”

3.0.4. It is possible to apply objective standards to the assessment of noise and the effect produced by the introduction of a certain noise source may be determined by several methods, as follows:

- The effect may be determined by reference to guideline noise values. British Standard (BS) 8233:2014 and World Health Organisation (WHO) “Guidelines for Community Noise” contain such guidelines.
- Another method is to compare the resultant noise level against the background noise level (LA90) of the area. This is the method employed by BS 4142:2014 to determine the likelihood of complaint from noise of an industrial nature. It is best suited to the assessment of steady or pseudo-steady noise.

3.0.5 British Standard 8233:2014 is principally intended to assist in the design of new dwellings; however, the Standard does state that it may be used in the assessment of noise from new sources being brought to existing dwellings.

3.0.6 The WHO guideline values are appropriate to what are termed “critical health effects”. This means that the limits are at the lowest noise level that would result in any psychological or physiological effect.

The WHO/BS 8233 guideline noise values are summarised in the following table:

Table 1

Guidance Document	L _{AeqT}	L _{AMax}	Outcome
World Health Organisation “Community Noise 2000”	55dB		Serious annoyance, daytime and evening. (Continuous noise, outdoor living areas)
	50dB		Moderate annoyance, daytime and evening. (Continuous noise, outdoor living areas).
	35dB		Moderate annoyance, daytime and evening. (Continuous noise, dwellings, indoors)
	30dB		Sleep disturbance, night-time (indoors)
		60dB	Sleep disturbance, windows open at night. (Noise peaks outside bedrooms, external level).
		45dB	Sleep disturbance at night (Noise peaks inside bedrooms, internal level)
BS 8233:2014 “Sound Insulation and noise reduction for buildings”	55dB		Upper limit for external steady noise. (gardens and patios).
	50dB		Desirable limit for external steady noise. (gardens and patios).
	L _{Aeq} 16 hours = 35 dB		Resting, living room day. (Internal – steady noise)
	L _{Aeq} 16 hours = 40 dB		Dining, dining room day. (Internal – steady noise)
	L _{Aeq} 16 hour = 35 dB		Sleeping, bedroom day (Internal – steady noise)
	L _{Aeq} 8 hours = 30 dB		Sleeping, bedroom day (Internal – steady noise)

- 3.0.7 For L_{AeqT} criteria the time base (T) given in the documents is 16 hours for daytime limits and 8 hours for night time limits. All surveys are conducted on 1 hour daytime and 15 minute night values – based on 1 second readings on a Type 1 sound level meter. The readings are taken every 5 mins for noise to allow the elimination of erroneous data if required.
- 3.0.8 The WHO guidelines are also concerned with the $L_{A_{Max}}$ for night-time sleep disturbance. The guideline states:
- “For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB $L_{A_{Fmax}}$ more than 10-15 times per night”
- 3.0.9 On this basis, for the purpose of assessing night-time $L_{A_{Fmax}}$ noise events, it is considered appropriate to adopt the 10th highest $L_{A_{Fmax}}$ noise event occurring in a typical night-time (23:00 – 07:00) period.
- 3.0.10 Audio recordings are taken throughout the measurements to allow for further assessments on high levels. Listening to the audio and performing tonal analysis will allow anomalies to be removed from the data, if required.

4.0 Results

4.1 Noise Assessment – Front (Stone Street)

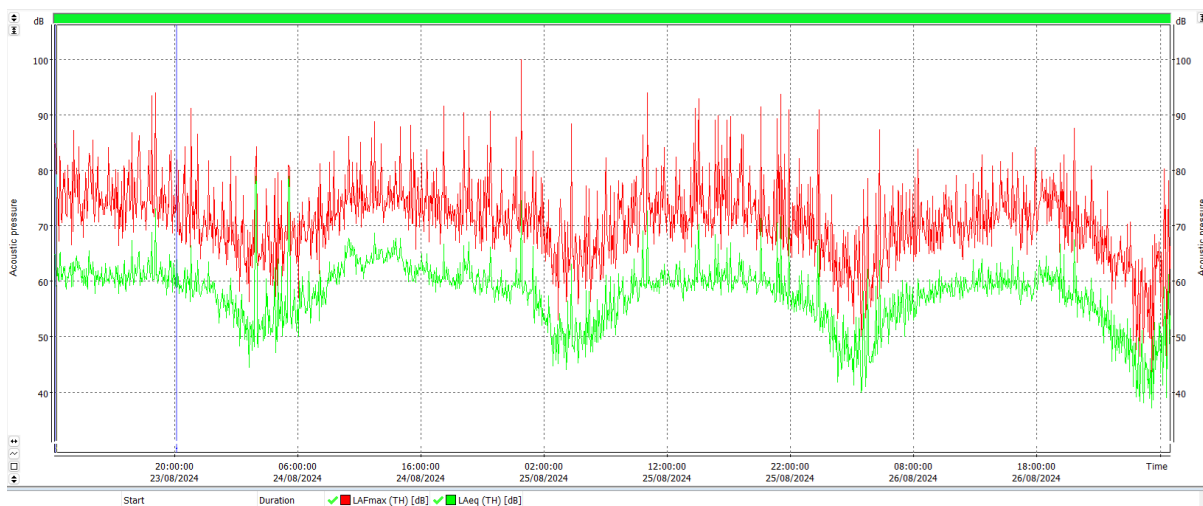
10.31am 23/08/24 – 10.18am 27/08/24

Table 2

Location	L _{Aeq_16hr}	L _{Aeq_8hr}	L _{Amax} (10th highest)
Front			
Day	60.8dBA		
Night		53.9dBA	74.7dBA

4.1.1 Comments: Mainly traffic pass-by noise. No tonal features

Figure 4



Time Period	Cloud Cover	Temperature (Celcius)	Presence of fog/snow/ice	Wind Speed (m/s)	Wind Direction
Installation	4	21	No	0.2	NW
Collection	7	23	No	0.8	NE

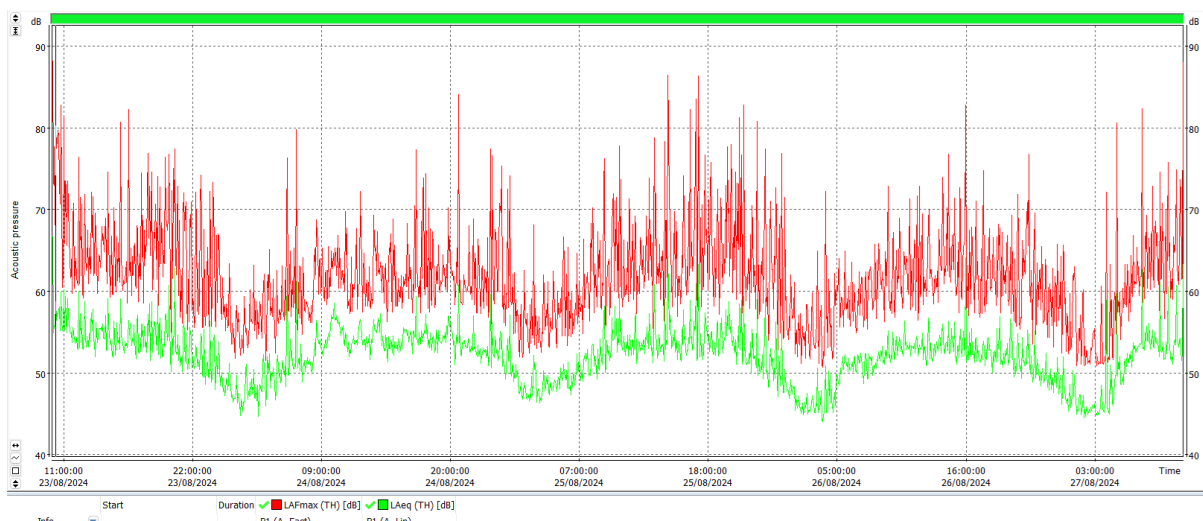
4.2 Noise Assessment – Rear

10.15am 23/08/24 – 10.22am 27/08/24

Table 3

Location	L _{Aeq_16hr}	L _{Aeq_8hr}	L _{Amax} (10th highest)
Front			
Day	54.1dBA		
Night		49.3dBA	64.9dBA

Figure 5



Time Period	Cloud Cover	Temperature (Celcius)	Presence of fog/snow/ice	Wind Speed (m/s)	Wind Direction
Installation	4	21	No	0.6	`NW
Collection	7	23	No	1.4	NE

4.3 Comparison of Results to BS8233

Table 4

Location	L _{AeqT} (16hr Day & 8hr Night)	L _{AMax}	BS8233 & WHO Internal noise	BS8233 & WHO External Noise	Difference to L _{Aeq} (internal/external)	Difference to Max (internal)
Front (Stone Street)						
Day (0700-2300)	61dBA		35dBA	55dBA	(+26dBA/ +6dBA)	-
Night (2300-0700)	54dBA	75 dBA (10 th Highest)	30dBA (45dBA L _{AMax})	(60dBA L _{AMax})	(+24dBA)	(+30dBA)
Rear						
Day (0700-2300)	54dBA		35dBA	55dBA	(+19dBA/ -1dBA)	-
Night (2300-0700)	49dBA	65 dBA (10 th Highest)	30dBA (45dBA L _{AMax})	(60dBA L _{AMax})	(+19dBA)	(+20dBA)

5.0 Observations and Further Discussions

- 5.0.1 The measured L_{Aeq} values for both the day and the night periods are shown in table 4. The day period at the front of existing property is 26dBA above the limit for indoor noise levels. The day value at the rear of the building is only 19dBA above the Bs8233:2014 limit and therefore a lower grade of windows could be installed at the rear of the property.
- 5.0.2 The night value at the front is 24dBA above the recommended value for internal noise to prevent sleep disturbance. The rear is 19dBA above the BS8233:2014 limit which reinforces the comment in 5.0.1 that a lower-grade of window could be used at the rear of the building.
- 5.0.3 BS8233 assumes that a standard double-glazed window will provide up to 15dB reduction when open (with some council guidelines leaning on the side of caution and assuming a 10dB reduction). Either option would mean that any glazed window in the building cannot be relied

upon as the source of ventilation without the chance of sleep disturbance being had by the inhabitants of the proposed dwellings to the front of the building. Trickle/acoustic vents will therefore be required throughout the property; to avoid the need to open windows to ventilate.

- 5.0.4 The L_{AMax} value to prevent the likelihood of sleep disturbance is set at 60dBA external and 45dBA internal. Based on the highest value from the tenth-highest daily value measured during the week the reading for L_{AMax} night at the front of the property was 75dBA. This value is 30dB above the required value externally for sleep disturbance. This therefore increases the required specification of the glazing to the front.
- 5.0.5 The L_{AMax} to the rear of the building that was not exceeded more than 10 times per night was 65dBA. This is 20dBA above the limit.
- 5.0.6 These figures will now be checked against the calculation methodology in BS8233 annex G to provide exact specifications in section 6. The values for the night L_{AMax} will be used in the calculation as they provide the greatest difference to BS8233 requirements for the rear of the property. As there are no bedrooms to the front the daytime L_{Aeq} value will be used.

5.1 BS8233 Calculation Sheet

(rear bedroom area, first floor)

		Overall dBA	Octave Band Frequency (Hz)					
Time Period			125	250	500	1000	2000	4000
LAMax	Night-time	64.9	54	56	57	58	59	57
Room Details		(m)	First Floor Bedroom					
Height		2.2						
Width		2.6						
Length		3.8						
Sample Room Volume		21.736						
Sample Room Surface Area		28.16						
Element		Area/No.of	Element Specification					
External Wall		5.72	Traditional brick and block with ties and insulation					
Windows		3	4 mm / (6 - 16 mm) / 4 mm Pilkington					
Ceiling		9.88						
Ventilation		1	Standard non-acoustic trickle ventilator typically $\geq D_{n,e,w}$ 30dB					
Element SRI								
Element		Area/No.of	Octave Band Frequency (Hz)					
Walls		4	47	49	49	58	68	79
Windows		1	21	17	25	35	37	31
Ceiling		1	28	34	40	45	49	52
Ventilation (Dn,e)		1	30	30	30	30	30	28
Overall Sound Reduction								
Calculated Internal SPL								
		Overall	125	250	500	1000	2000	4000
Leq,2		38.4	19.9	30.8	30.9	30.3	31.9	32.6
Limit		45						
Value under limit		6.6						

(front Living area, first floor)

Time Period		Overall dBA	Octave Band Frequency (Hz)					
			125	250	500	1000	2000	4000
L _{Aeq}	Daytime	60.8	49	51	52	54	56	53

Room Details	(m)	Living Room First Floor
Height	2.2	
Width	5.1	
Length	4.6	
Sample Room Volume	51.612	
Sample Room Surface Area	42.68	

Element	Area/No.of	Element Specification
External Wall	11.22	Traditional brick and block with ties and insulation
Windows	3	4 mm / (6 - 16 mm) / 4 mm Pilkington
Ceiling	23.46	
Ventilation	1	Standard non-acoustic trickle ventilator typically $\geq$ D _{n,e,w} 30dB

Element SRI

Element	Area/No.of	Octave Band Frequency (Hz)						Single Figure Rating
		125	250	500	1000	2000	4000	
Walls	4	47	49	49	58	68	79	57
Windows	1	21	17	25	35	37	31	29
Ceiling	1	28	34	40	45	49	52	
Ventilation (D _{n,e})	1	30	30	30	30	30	28	30

Overall Sound Reduction

Calculated Internal SPL

	Overall	Octave Band Frequency (Hz)					
		125	250	500	1000	2000	4000
L _{eq,2}	31.7	14.1	23.5	23.6	23.8	26.0	25.7
Limit	35						
Value under limit	3.3						

6.0 Glazing, Structural and Ventilation Recommendations

6.1 External Walls

6.1.1 External walls of the proposed building are understood to be traditional 9" brick:

Table 5

Description	Octave Band Centre Frequency (Hz)					
	Sound Reduction Index R dB					
	125	250	500	1k	2k	4k
Traditional solid 9" brick & block with cavity	47	49	49	58	68	79

6.2 Glazing

6.2.1 Suitable sound insulation performance of all windows and patio doors of the development may be achieved with standard double-glazing type 4-airgap-4, typically $\geq R_w 30$ dB. An example product for noise reduction to the front of the property is shown in table 6.

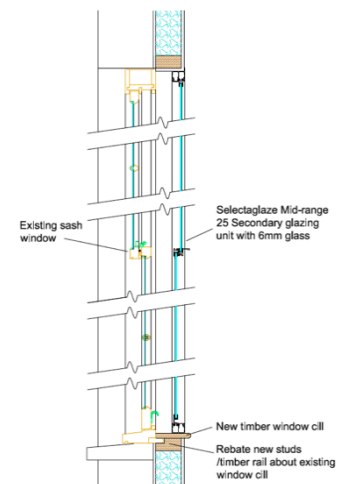
Table 6

Description	Octave Band Centre Frequency (Hz)						Rw (C; Ctr)
	Sound Reduction Index R dB						
	125	250	500	1k	2k	4k	
Pilkington 4 mm / (6 - 16 mm) / 4 mm	21	17	25	35	37	31	29 (-1,-4)

6.2.2 As the building is listed the R_w rating specified in table 6 will need to account for the existing panes as well as secondary glazing. Suitable sound insulation performance of all windows of the development may be achieved with secondary glazing with 100mm cavity gap. The suggested configuration can be seen in table 7 below in order to meet the criteria. BS8233:2014 annex G calculations suggest that the 4mm glass configuration should be used from the table in order to meet the criteria of 35dB internal during the day and 30dB during the night.

Table 7

Secondary Glass Thickness	Rw dB values for Selectaglaze Ltd Secondary Glazing Systems*																							
	S10 HS	S15 HS	S20 VS	S25 VS	S31 LO	S41 SHC	S41 DSH	S41 LO	S40 FL	S44 SHC	S44 DSH	S45 SHC	S45 DSH	S45 LO	S46 FL	S50 SHC	S50 LO	S55 DFL	S60 TVS	S80 HS	S85 HS	S90 VS	S95 VS	
	100mm cavity																							
4mm Toughened	43		43									45	43	45					44					
6mm Toughened	43		43			45	43	45	45			45	43	45	45	44	44		44	44		44		
6.4mm	43		43			45	43	45	45			45	43	45					44	44		44		
6.4mm Acoustic	44		44			46	44	46	46			46	44	46					45	45		45		
6.8mm	44		44			46	44	46	46			46	44	46					45	45		45		
6.8mm Acoustic	44		44			46	44	46	46			46	44	46					45	45		45		
7.5mm						46	44	46	46							45	45	44		45		44	44	
8mm Toughened						47	45	47	47											46		46		
8.8mm						47	45	47	47											46		46		
8.8mm Acoustic						47	45	47	47							46	46			46		46		
9.5mm						47	45	47	47						47	46	46	45		46	45	46	45	
10mm Toughened						47	45	47	47											46		46		
10.8mm Acoustic						48	46	48	48							47	47			47		46		
10.8mm						48	46	48	48							47	47			47		46		
11.5mm						48	46	48	48						48	47	47	46		47	46	47	46	
12mm Toughened						48	46	48	48											46		46		



6.2.3 The Rw values quoted for the HS (Horizontal Sliding), VS (Vertical Sliding) or LO (Lift Out) products would all far exceed the requirements for the site providing at least Rw 43dB. The site only needs to achieve around Rw30 for total attenuation from the glazing spec.

6.3 Ventilation

6.3.1 It is anticipated that a basic ventilation system will be needed to be incorporated into the scheme design to reduce the impact of the $L_{A,Max}$ levels, such that residents of the properties are able to have background ventilation without necessarily needing to open windows.

Table 8

Description	Octave Band Centre Frequency (Hz)					
	Sound Reduction Index $D_{n,e}$ dB					
	125	250	500	1k	2k	4k
Standard acoustic trickle ventilator typically $\geq D_{n,e,w}$ 30dB	30	30	30	30	30	28

7.0 Further Discussion and Conclusion

- 7.0.1 The glazing specification listed in section 6 would be more than suitable based on the calculation methodology in Annex G of BS8233:2014 for noise impact on bedrooms and living spaces throughout the property. The listed status of the building does mean that secondary glazing will need to be used.
- 7.0.2 It is advised that the same specification of glazing and acoustic vents are used throughout the building to avoid any adverse impact on the inhabitants of the proposed dwellings.
- 7.0.3 If the ventilation of the building is not possible through trickle vents due to building restrictions on the windows themselves, mechanical ventilation may be required. An example suitable product would be the Sonair 3. Further details of this product are in Appendix E. This would also meet the acoustic specification provided by this report.

8.0 Credentials

Name	Title	Credentials
James Flitton BSc AMIOA	Acoustic Consultant	CSCS Professionally Qualified person
		Associate Member Institute of Acoustics
		IOA Diploma in Acoustics & Noise Control
		Affiliate Member of IDE
		Affiliate Member of IOR
Signed		

Appendix A – Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu Pa$. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A – weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. Generally used to describe background noise level.

Appendix B - Noise Survey Instrumentation

- Svantek Class 1 noise monitoring station model 307 serial number 75982 with integrated preamplifier plus ST30 microphone serial number 78375 in weatherproof outdoor environmental kit and tripod arrangement
- Brüel & Kjær calibrator type 4231 serial number 3001014 (UKAS-certified)

Appendix C – Weather Conditions Chart Used

(blank version)

Weather Conditions				
Measurement Location	Date/Time	Description	Beginning of Survey	End of Survey
		Temperature:		
Cloud Cover Symbol Scale in oktas (eighths) 0 Sky completely clear 1 2 3 4 Sky half cloudy 5 6 7 8 Sky completely cloudy (9) Sky obstructed from view		Precipitation:		
		Cloud cover (oktas - see guide)		
		Presence of fog/snow/ice		
		Presence of damp roads/wet ground		
		Wind Speed (m/s)		
		Wind Direction		
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)		

Appendix D – BS8233:2014 Annex G Calculation Sheet

		Octave Band Frequency (Hz)					
		125	250	500	1000	2000	4000
Leq,ff	A	54	56	57	58	59	57
Dn,e		30	30	30	30	30	28
$\frac{A_o}{S} 10^{\frac{-D_{n,e}}{10}}$	B	0.00064	0.00064	0.00064	0.00064	0.00064	0.00102
$\frac{R_{wi}}{S_f} 10^{\frac{-R_{wi}}{10}}$	C	0.00417	0.01046	0.00166	0.00017	0.00010	0.00042
$\frac{R_{ew}}{S_f} 10^{\frac{-R_{ew}}{10}}$	D	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000
$\frac{R_{rr}}{S_f} 10^{\frac{-R_{rr}}{10}}$	E	0.00274	0.00069	0.00017	0.00005	0.00002	0.00001
10log10(B+C+D+E)	F	-21.2	-19.3	-26.1	-30.6	-31.1	-28.4
A (furnished)		11	14	16	16	15	14
$\text{Log}10 \frac{S}{A}$		0.2	0.0	0.0	0.0	0.0	0.0
Leq,2	A+F+G+3	35.9	39.8	33.9	30.3	30.9	31.6
A-weighting		-16	-9	-3	0	1	1
LAeq,2		19.9	30.8	30.9	30.3	31.9	32.6
Total		38.4					

		Octave Band Frequency (Hz)					
		125	250	500	1000	2000	4000
Leq,ff	A	49	51	52	54	56	53
Dn,e		30	30	30	30	30	28
$\frac{A_o}{S} 10^{\frac{-Dn,e}{10}}$	B	0.00029	0.00029	0.00029	0.00029	0.00029	0.00046
$\frac{Rwi}{Sf} 10^{\frac{-Rwi}{10}}$	C	21	17	25	35	37	31
$\frac{Rwi}{Sf} 10^{\frac{-Rwi}{10}}$	C	0.00212	0.00533	0.00085	0.00008	0.00005	0.00021
$\frac{Rw}{Sew} 10^{\frac{-Rw}{10}}$	D	47	49	49	58	68	79
$\frac{Rw}{Sew} 10^{\frac{-Rw}{10}}$	D	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000
$\frac{Rrr}{Srr} 10^{\frac{-Rrr}{10}}$	E	28	34	40	45	49	52
$\frac{Rrr}{Srr} 10^{\frac{-Rrr}{10}}$	E	0.00331	0.00083	0.00021	0.00007	0.00003	0.00001
10log10(B+C+D+E)	F	-22.4	-21.9	-28.7	-33.6	-34.3	-31.7
A (furnished)		11	14	16	16	15	14
$\text{Log}10 \frac{S}{A}$		0.5	0.4	0.3	0.3	0.4	0.4
Leq,2	A+F+G+3	30.1	32.5	26.6	23.8	25.0	24.7
A-weighting		-16	-9	-3	0	1	1
LAeq,2		14.1	23.5	23.6	23.8	26.0	25.7
Total	31.7						

Appendix E – Mechanical Ventilation Specification

Sonair 3

Acoustic (sound attenuating) filtered air supply units

For use fitted through walls

Sonair 3 provides mechanical input ventilation when switched on, when switched off provides background trickle ventilation which includes a controllable shutter.

It is designed with sound attenuating features to reduce noise transferring from outside to inside the home

Sonair 3 is a wall mounted input fan featuring a detachable remote control with an LED speed indicator.

- Sonair 3 ventilates and filters the air
- Independently tested for acoustic performance
- Exceptional sound attenuation (up to 58dB)
- Air cleaning
- Low energy



Features & Benefits

- Meets guidelines for occupant accessibility
- Increase occupant awareness of system operation
- Discreet design
- power lead is 1.8m long and fitted with a 3 pin plug
- Supplied with a flexible 1.8m long cable with a 13 amp 3 pin plug fitted with a 3 amp fuse

Performance

Approximate input airflow rate (m³/h) – 20-150m³/h

Acoustic Dn,e,w (-1/-) – Dn,e,w (C;Ctr) 58(-1;-2)dB*

Tested to the 'Noise Insulation Regulations'

Background ventilation rate of 2400EA when the unit is switched off, recirculation flap closed and with the shutter open

*Sound insulating tube D100 required

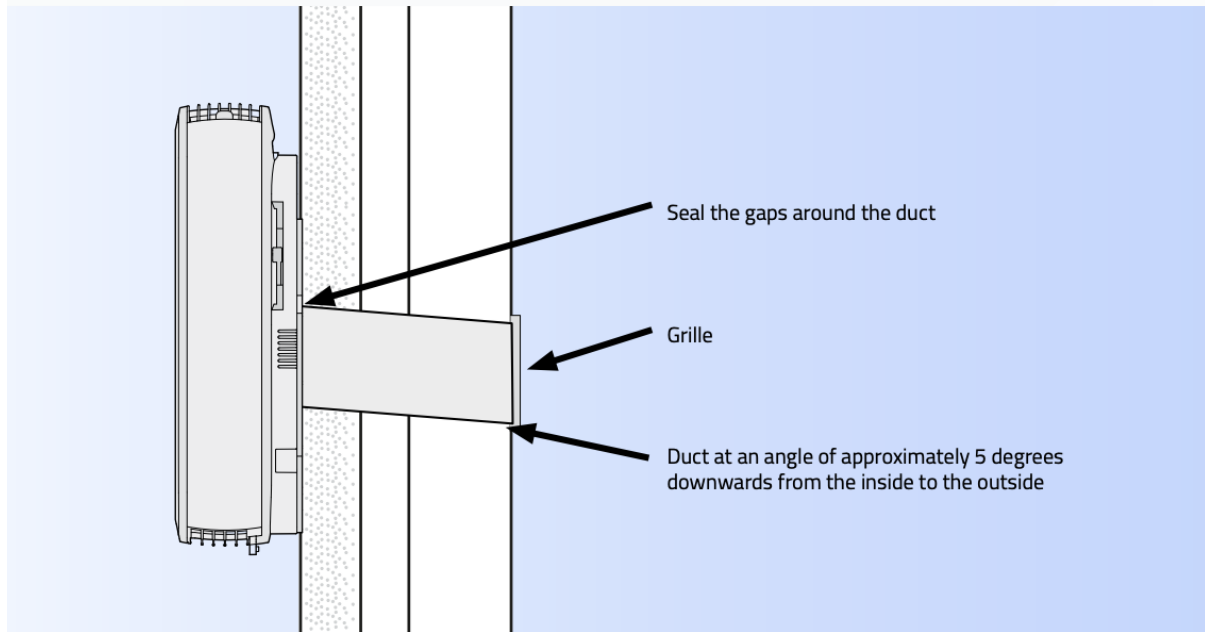
Product	Product Code
Sonair 3 including G4/ISO Coarse 60%	352004
Sonair 3 Filter G4/ISO Coarse 60%	535083
Sonair 3 Sound Insulating Tube D100	110361
100mm dia (non-sound insulating) duct 350mm long	8960097
White external grille	8960105
Brown external grille	8960102
Beige external grille	8960103

All items supplied separately

Control

The Sonair 3's portable remote control lets you control the amount of freshly supplied outdoor air. The Sonair 3 has 10 ventilation settings.

Installation



Acoustics

As population density increases, acoustics are becoming an increasingly important factor. Consequently, there is a greater need for sound-attenuating ventilators. Standard or acoustic trickle ventilators cannot provide the necessary attenuation levels, so more sophisticated solutions are required. The Sonair 3 meets these requirements by achieving acceptable noise-reducing levels.

Sound Production

Sound pressure level, LpA; 10 m² according to ISO 3741.

Speed Setting	Approximate Capacity	Sonair 3
		G4/ISO Coarse 60%
1	20m ³ /h	<11.3
2	30m ³ /h	<11.8
3	40m ³ /h	<15.3
4	50m ³ /h	20.8
5	60m ³ /h	24.8
6	70m ³ /h	29.3
7	85m ³ /h	33.8
8	105m ³ /h	39.3
9	125m ³ /h	43.8
10	150m ³ /h	49
Sound Attenuation according to ISO 10140-2 and BS EN ISO 717-1**		
	Dn,e,w (C,Ctr)	58(-1;-2)dB*

*Sound insulating tube D100 required

**Independently tested by the BRE to requirements of noise insulation regulation

Dimensions

445 (H) x 340 (W) x 134 (D)

Housing

Plastic ABS white RAL 9003

Voltage

220-240V/50 Hz

Energy Consumption

0.5W at standby to 22.7W at max speed (150m³/h)

Ventilation Capacity

Max is 41.7l/s (150m³/h) with ISO Coarse 60% filter

Duct

Ø100 mm (standard)

Warranty

2 years

More information

www.titon.com or 01206 814879