

ABBEY AREA, PHASE 3

External Building Fabric Assessment

Reference: 9770.RP01.EBF.4 Prepared: 29 April 2022 Revision Number: 4

Wates

Wates House Station Approach Leatherhead Surrey KT22 7SW

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	7 January 2022	Toby Walton	Russell Richardson
1	Minor amendments	7 March 2022	Toby Walton	Russell Richardson
2	Commentary on Vibration	8 April 2022	Toby Walton	Russell Richardson
3	Minor amendments	25 April 2022	Toby Walton	Russell Richardson
4	Updated drawing references	29 April 2022	Toby Walton	Russell Richardson

Terms of contract:

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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and will need to be developed into full working drawings by the lead designer to incorporate all other design disciplines.



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1.0 INTRODUCTION

The proposed development consists of the demolition and redevelopment of Emminster and Hinstock blocks including Belsize Priory Health Centre, Abbey Community Centre, public house and commercial units to provide new residential accommodation (Use Class C3) and ground floor commercial space (Use Class E/Sui Generis) to be used as flexible commercial units, across three buildings ranging from 4 to 11 storeys, along with car and bicycle parking, landscaping and all necessary ancillary and enabling works.

The site is located in London with Abbey Road and Belsize Road running adjacent to the development area. To the south of the site is a railway line comprising six tracks of both east and west bound rail traffic within a cutting, with London Overground, Virgin and London Midland rail traffic. The trainline is screened from Phase 3 of the development by the existing Phase 1.

An environmental noise survey has been undertaken at the site to determine the existing noise climate. An assessment has been carried out, based on the noise survey results, in relation to the noise levels likely to be incident on the proposed building facades and to provide acoustic performance specifications such that acceptable internal noise criteria can be achieved.

This report sets out the acoustic performance requirements of the external building fabric elements. In addition, suitable plant noise emission criteria have also been developed based upon the survey results and the requirements of the Local Authority.

2.0 SITE DESCRIPTION

The site as it currently exists is shown in relation to its surroundings in the site plan in Figure 1 (Appendix F).

The site is located at the junction of Abbey Road and Belsize Road. The frontage of the proposed Blocks B and C is located on Belsize Road, with the frontage of the proposed Block A on Abbey Road. The site as it is proposed is shown on the façade zoning plans in Appendix F.

The rear of the proposed blocks to the east of the site are bound by the rear gardens of existing houses located on Priory Terrace.

The main sources of noise affecting the site are road traffic movements along Abbey Road and Belsize Road.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Survey Methodology

Monitoring of the prevailing background noise was undertaken over the following periods:

Positions 1, 2 & 3 – 13:00 hours Wednesday 15 December to 13:00 hours Friday 17 December 2021.

Position 4 - 13:00 hours Wednesday 15 December to 07:00 hours Monday 20 December 2021.

As the survey was unattended it is not possible to comment with certainty regarding meteorological conditions throughout the entire survey period. However, based on observations during the site visits and weather reports for the area, conditions were generally considered suitable for obtaining representative noise measurements, being predominantly dry with little wind. Measurements were made of the L_{A90} , L_{Amax} and L_{Aeq} noise levels over sample periods of 15 minutes.

3.2 Measurement Locations

To determine the existing noise climate around the site measurements were undertaken at the following locations:

Measurement Position 1 – Rear of Site

The microphone was positioned on an A-frame fixed externally to a second-floor balcony overlooking the rear of the houses located on Priory Terrace. The dominant noise source at this position was road traffic on both Belsize Road and Abbey Road. The results at this position are considered to be subject to façade reflection effects.

Measurement Position 2 – Belsize Road

The microphone was positioned on an A-frame fixed externally to a second-floor Balcony overlooking Belsize Road. The dominant noise source at this position was road traffic on Belsize Road. The results at this position are considered to be subject to façade reflection effects.

Measurement Position 3 – Abbey Road

The microphone was positioned on an A-frame fixed externally to a first-floor window overlooking Abbey Road. The dominant noise source at this position was road traffic noise on Abbey Road. The results at this position are considered to be subject to façade reflection effects.

Measurement Position 4 - Belsize Road

The microphone was positioned on an A-frame fixed externally to a second-floor balcony overlooking Belsize Road. The dominant noise source at this position was road traffic on Belsize Road. The results at this position are considered to be subject to façade reflection effects.

The measurement positions are also illustrated on the site plan attached in Figure 1 and photos in Figures 2 - 5 (Appendix F).

3.3 Instrumentation

For information regarding the equipment used for the measurements please refer to Appendix D.

The sound level meters were calibrated both prior to and on completion of the survey with no significant calibration drifts observed.

3.4 Results

The noise levels measured are shown as time-histories on the attached Graphs 1 - 12 (Appendix F).

The typical L_{A90} and the period averaged L_{Aeq} noise levels measured are summarised in Table 1, along with typical L_{AFmax} levels measured during the night-time.

			Table 1	– Measured Levels
Measurement Position	Measurement Period	Typical La90,15min (dB)	∠ _{Aeq} (dB)	Typical L _{AFmax,5min} (dB)
Massurement Desition 1	Daytime (07:00 – 23:00)	44	53*	N/A
Measurement Fosition 1	Night-time (23:00 – 07:00)	40	46*	66*
Macoursement Desition 2	Daytime (07:00 – 23:00)	43	59*	N/A
Measurement Position 2	Night-time (23:00 – 07:00)	32	52*	73*
Management Desition 2	Daytime (07:00 – 23:00)	47	61*	N/A
Measurement Position 3	Night-time (23:00 – 07:00)	34	54*	73*
Management Desition (Daytime (07:00 – 23:00)	43	60*	N/A
Measurement Position 4	Night-time (23:00 – 07:00)	42	55*	74*

*These levels have been façade corrected.

4.0 EXTERNAL BUILDING FABRIC CRITERIA

This section outlines typical assessment criteria in terms of the relevant standards.

4.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF), July 2021, sets out the Government's planning policies for England. In respect of noise, Paragraph 185 of the NPPF states the following:

Planning policies and decisions should 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

The above presents no quantitative guidance on a site's suitability for residential development.

4.2 Camden Local Plan 2017

The requirements of regarding noise and vibration as provided in Camden Local Plan 2017 are given below.

Policy A4 Noise and Vibration

The council will seek to ensure that noise and vibration is controlled and managed.

Development should have regard to Camden's Noise and Vibration (Appendix 3). We will not grant planning permissions for:

- a. development likely to generate unacceptable noise and vibration impacts; or
- *b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.*

We will only grant permission for noise generating development, including any plant any machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phase of development.

Appendix 3 of the Camden Local Plan reads as follows:

The significance of noise impact varies dependent on the different noise sources, receptors and times of operation presented for consideration within a planning application. Therefore, Camden's thresholds for noise and vibration evaluate noise impact in terms of various 'effect levels' described in the National Planning Policy Framework and Planning Practice Guidance:

- NOEL No Observed Effect Level
- LOAEL Lowest Observed Adverse Effect Level
- SOAEL Significant Observed Adverse Effect Level

Three basic design criteria have been set for proposed developments, these being aimed at guiding applicants as to the degree of detailed consideration needed to be given to noise in any planning application. The design criteria outlined below are defined in the corresponding noise tables. The values will vary depending on the context, type of noise and sensitivity of the receptor:

- Green where noise is considered to be at an acceptable level.
- Amber where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.
- *Red where noise is observed to have a significant adverse effect.*

4.3 Plant Noise Emission Criteria

Policy A4 of Camden Local Plan 2017 provides the following information regarding the required noise levels for proposed plant items:

A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS4142) will be used. For such cases a 'Rating Level' of 10dB below background (15dB if tonal components are present) should be considered as the design criterion.

In line with the above requirements, we would propose items of mechanical services be designed so that noise emissions from the plant do not exceed the following levels when assessed at the nearest noise sensitive receptors:

Location	\mathcal{L}_{Aeq} Noise Level limit of all operating plant (dB) at 1m from the nearest noise sensitive façade				
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)			
Belsize Road façades	331	221			
Abbey Road façades	37	24			
Priory Terrace rear façades	34	30			

Table 4 – Plant Noise Emission Limits

¹Limits taken from Measurement Position 2

4.4 Camden Planning Guidance – Amenity

The expectations of information pertaining to noise and vibration expected to be present in acoustic reports has been outlined within the Camden Planning Guidance (Amenity) document published in January 2021, which in turn references the application of Local Plan Policy A4.

This acoustic report has been prepared with consideration of the aforementioned document as the development will be located near high levels of existing noise generated by the surrounding road networks.

4.5 British Standard 8233:2014

British Standards Institution (2014) *BS 8233:2014: Guidance on Sound Insulation and Noise Reduction for Buildings* draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions.

The noise level values given are in terms of an average (L_{Aeq}) level.

The standard advises internal ambient noise levels for achieving suitable resting and sleeping conditions within residential properties as set out in Table 2.

Room	07:00 to 23:00 (dB LAeq,16hour)	23:00 to 07:00 (dB LAeq,8hour)
Living Rooms	35	
Dining Room/area	40	
Bedrooms	35	30

Table 2 – BS 8233:2014 Residential Criteria

4.6 ProPG

ProPG: Planning & Noise provides guidance on a recommended approach to the management of noise within the planning system in England and was published by the Association of Noise Consultants, the Institute of Acoustics and the Chartered Institute of Environmental Health in May 2017.

It encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. In light of the recent publication of ProPG, it was considered appropriate to make use of this document for this report, containing the results of our noise survey and provides advice for the pre-planning stage of development conditions.

ProPG provides the following Noise Risk Assessment scale:

Table 3 – ProPG Noise Impact Risk Assessment

Noise Risk	Indicative <i>L</i> Aeq, period Noise Levels (dB)		Comments	
	Daytime LAeq, 18 hr Night-time LAeq, 8 hr (07:00 – 23:00) (23:00 – 07:00)			
Negligible	<50 dB	<40 dB	These noise levels indicate that the development site is likely to be acceptable, and the application need not normally be delayed on noise grounds.	
Low	50 dB < L < 60 dB	40 dB < L < 50 dB	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.	
Medium	60 dB < L <70 dB	50 dB < L <60 dB	As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts	

Noise Risk	Indicative LAeq, period Noise Levels (dB)		Comments	
	Daytime LAeq. 18 hr (07:00 – 23:00) Night-time LAeq. 8 hr (23:00 – 07:00)			
			of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.	
High	>70 dB	>60 dB	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.	

4.7 World Health Organisation Guidelines

WHO (2018) *Environmental Noise Guidelines for the European Region* sets out to define "*recommended exposure levels for environmental noise in order to protect population health*". The guidance document relates specifically to external noise levels, and recommends that "*all CNG* [WHO (1999) *Guidelines for Community Noise*] *indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid*". RBA Acoustics therefore makes reference to Guidelines for Community Noise for recommendations on internal noise levels.

Guidelines for Community Noise describes guideline levels that are "*essentially values for the onset of health effects from noise exposure*". A table of guideline values is included, relating to adverse health effects, defined as any temporary or long-term deterioration in physical, psychological, or social functioning that is associated with noise exposure. The following is an extract from Table 4.1: Guideline values for community noise in specific environments, as stated in the WHO document.

Specific Environment	Critical Health Effect(s)	L _{Aeq} (dB)	Time Base (hours)	L _{Amax,f} (dB)
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-times	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

Table 4 – Guideline Values for Community Noise

With reference to maximum noise levels the following guidance is provided within the WHO guidance:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991) and most studies show an increase in the percentage of awakenings at SEL values of 55-60 dBA (Passchier-Vermeer 1993; Finegold et al. 1994; Pearsons et al. 1995). For intermittent events that approximate aircraft noise, with an effective duration of 10-30s, SEL values of 55-60 corresponds to a L_{Amax} value of 45dB. Ten to 15 of these events during an 8 hour night-time implies a L_{Aeq, 8h} of 20-25dB. This is 10-15dB below the L_{Aeq, 8h} or 30dB for continuous nighttime noise exposure, and shows that intermittent character of noise must be taken into account when setting night-time noise limits for noise exposure. For example, this can be

Table 5 – Noise Risk Assessment

achieved by considering the number of noise events and the difference between the maximum sound pressure level and the background of these events."

Therefore the frequency of occurrence of maximum noise events should not typically exceed 10-15 times in any night.

4.8 Summary

The project criteria adopted are therefore as follows:

Bedrooms	Night-time (23:00-07:00)	30 dB L _{Aeq} 45 dB L _{Amax,f} (not normally exceeded)
Living Rooms	Daytime (07:00-23:00)	35 dB LAeq

5.0 NOISE ASSESSMENT

As discussed in Section 4.3, ProPG provides an early indication of the likely suitability of a site for new residential development. ProPG provides a framework for considering good acoustic design.

The noise levels at the façade line of the proposed development fall within the following Noise Risk categories as defined in ProPG for both daytime and night-time periods.

Maagurament Decition	Noise Exposure Category (NEC)			
Measurement Position	Daytime	Night-time		
Measurement Position 1	Low	Low		
Measurement Position 2	Low	Medium		
Measurement Position 3	Medium	Medium		
Measurement Position 4	Medium	Medium		

ProPG states that as noise levels increase, a good acoustic design process should be followed and demonstrated.

Table 6 - Sound Reduction Indices of Non-Glazed Elements

6.0 EXTERNAL BUILDING FABRIC ASSESSMENT

6.1 Background

External noise levels are such that noise control measures are required in order to result in acceptable internal noise levels within future dwellings. Appropriate internal noise levels can be achieved providing suitable building envelope constructions are employed.

An initial analysis of the external building fabric of the proposed scheme has been undertaken in order to demonstrate achievable internal noise levels and outline methods of ensuring such noise levels.

6.2 Preliminary Assessment

Our initial assessment of achievable internal noise levels has been based upon the following information:

- Environmental noise survey data reported herein
- External wall construction is brickwork or lightweight cladding (see below)
- Living rooms will typically contain hard floor surfaces, curtains and soft furnishings and bedrooms will be carpeted

External Wall Areas

We have assumed the following sound reduction indices, equating to an overall R_w of 52 dB for all non-glazed façade areas:

			10				
Assumed Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
36	41	45	45	54	58	58	58

Drawings

The assessment has been based on the information provided in the following Pollard Thomas Edwards drawings:

Drawing No.	Description	Revision	lssue date
ARR- PTE- VA-ZZ-DR-A-10141	Proposed Block A Plans – Ground & First to Fifth Floor	-	April 2022
ARR- PTE- VA-ZZ-DR-A-10142	Proposed Block A Plans – Sixth to Eighth Floor & Roof	-	April 2022
ARR- PTE- VB-ZZ-DR-A-10143	Proposed Block B Plans – Ground & First to Sixth Floor	-	April 2022
ARR- PTE- VB-ZZ-DR-A-10144	Proposed Block B Plans – Seventh to Tenth Floor & Roof	-	April 2022
ARR- PTE- VC-ZZ-DR-A-10145	Proposed Block C Plans – Ground & First to Third Floor	-	April 2022
ARR- PTE- VC-ZZ-DR-A-10146	Proposed Block C Plans – Fourth to Fifth Floor & roof	-	April 2022
ARR- PTE- ZZ-00-DR-A-10040	Proposed Site Plan	-	April 2022

Ventilation

It is understood that MVHR is to be utilised throughout the development and no unducted trickle ventilators or through-the-wall ventilators will be required. It should be noted that MVHR systems provide background ventilation only. With reference to our Level 2 Overheating Assessment (reference 9770.RP02.AV02.2 dated 29 April 2022, we understand that a temperature lopping solution is to be utilised as the main method of mitigating overheating.

6.3 Specification & Guidance Constructions

Appendix C details the sound reduction performance specification for the ventilators and glazed elements of the external building fabric.

The glazing performance specifications apply to the glazing package as a whole - inclusive of glazing, louvres, spandrel panels, framing, opening lights, doors, seals, etc. The performance of the glazing system will depend on many factors such as the glazing configuration, size of window panels, quality of framing, quality of sealing, etc.

Please note – The glazing configurations described in Table 7 are given for <u>costing purposes only</u>. All window systems should be capable of meeting the performance specifications shown in Appendix C, with laboratory test certificates being made available in support of the quoted performance. Glazing proposals which simply reflect the guidance constructions indicated in this report will not, in isolation, be sufficient evidence that a window configuration will meet the performance specification.

For guidance purposes we would typically expect the following glazing configurations to prove commensurate with achieving the sound insulation performance specifications detailed within Appendix C.

Table 7 – Guidance on Glazing Constructions

Glazing Type	Example Glazing Configuration
G1	Medium performance double glazing, i.e. 10 mm glass / 12 mm cavity / 6 mm glass
G2	Low performance double glazing, i.e. 6 mm glass / 12 mm cavity / 8 mm glass
G3	Standard double glazing with panes of differing thicknesses, e.g. 4 mm glass / 12 mm cavity / 6 mm glass

6.4 Applicable Zoning

Due to the differences in the prevailing noise climate around the site and the types of rooms at each floor level, two primary glazing zones have been defined, as indicated on the façade zoning plans provided in Figures 6 - 8 in Appendix F.

(i)	Zone 1	-	Bedrooms	Glazing Type:	G1
			Living Rooms	Glazing Type:	G2
(ii)	Zone 2	-	Bedrooms	Glazing Type:	G3
			Living Rooms	Glazing Type:	G3

7.0 VIBRATION

The nearest major source of groundborne vibration appears to be the railway which runs in excess of 50 metres to the south-east of the site. From extensive previous experience on similar sites, given the development site's distance from the railway lines we do not anticipate groundborne vibration due to train passbys would be detectable at the development site, and re-radiated noise from rail activities to be significantly below normal levels.

8.0 CONCLUSION

RBA Acoustics have undertaken noise monitoring at the proposed development site at Abbey Area, Phase 3. The measured noise levels are presented within this report. The resultant noise levels have been used in the assessment of the glazing requirements to ensure suitable internal noise levels are achieved at the proposed development with reference to ProPG, BS 8233:2014 and WHO Guidelines.

We do not consider planning approval should be rejected on the basis of noise and can confirm internal noise levels can be effectively controlled in line with the criteria presented in Section 4.0 by implementing the glazing configurations presented. Target specifications for glazing and ventilation are included in Appendix C to this report.

Plant noise emission limits have also been set in line with the requirements of Camden Council, although at this stage there is insufficient information available to undertake a detailed plant noise emission assessment. This can be undertaken when plant selections are made available.

Appendix A – Acoustic Terminology

A-weighting (e.g. dB(A))	A correction applied across the frequency bands to take into account the response of the human ear, and therefore considered to be more representative of the sound levels people hear.
DeciBel (dB)	Unit used for many different acoustic parameters. It is the logarithmic ratio of the level being assessed to a standard reference level.
<i>D</i> n,e,w	A single number weighted quantity which characterises the airborne sound insulation through a specified small element. A higher numerical quantity represents a better performance.
$L_{eq,T}$	The level of a notional steady sound which, over a stated period of time, <i>T</i> , would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
LAeq, T	The A-weighted level of a notional steady sound which, over a stated period of time, <i>T</i> , would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
Lan (e.g. La10, La90)	The sound level exceeded for n% of the time. E.g. L_{A10} is the A-weighted level exceeded for 10% of the time and as such can be used to represent a typical maximum level. Similarly, L_{A90} is the level exceeded for 90% of the measurement period, and is often used to describe the underlying background noise.
Lamax, T	The instantaneous maximum A-weighted sound pressure level which occurred during the measurement period, <i>T</i> . It is commonly used to measure the effect of very short duration bursts of noise, e.g. sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the ambient level.
Octave band	A frequency band in which the upper limit of the band is twice the frequency of the lower limit.
1/3 Octave band	A frequency band which is one-third of an octave band.
Rw	A single number quantity which characterises the airborne sound insulation of a material or building element in a laboratory test.

Appendix B – Room Absorption Coefficients

For the purposes of the analyses RBA have assumed the absorption coefficients detailed in Table B1 for bedrooms and Table B2 for living rooms.

Table B1 – Bedroom Absorption Coefficients

Absorption Coefficient (a) at Octave Band Centre Frequency (Hz)									
63	125	250	500	1k	2k	4k	8k		
0.15	0.18	0.25	0.27	0.31	0.32	0.32	0.32		

Table B2 – Living Room Absorption Coefficients

Absorption Coefficient (a) at Octave Band Centre Frequency (Hz)									
63	125	250	2k	4k	8k				
0.15	0.18	0.20	0.22	0.22	0.22	0.23	0.27		

Appendix C – External Building Fabric Acoustic Specification

External facade constructions and components, such as brise soleil, grilles, ventilators, curtain walling systems or other architectural features, are not to give rise to intrusive whistling, creaking, rattling or other noises as a result of wind or other climatic effects. The Contractor shall take reasonable precautions to avoid unwanted noise including creaking, rattling and whistling being generated by the Contractors works when subject to environmental conditions (including wind) and thermal expansion over the life of the façade.

1.0 Window Sound Insulation Performance

Glazed units (inclusive of glazing, louvres, timber panels, spandrel panels, infill panels, framing, opening lights, balcony/terrace doors, seals, etc. as appropriate) should achieve the following minimum sound reduction indices as tested in general accordance with BS EN ISO 10140-2:2010:

Туре	Minimum Recommended Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)									
	63	125	250	500	1k	2k	4k	8k	(dB)	
G1	23	26	27	34	40	40	46	46	38	
G2	23	23	23	30	38	38	43	43	35	
G3	19	23	23	27	38	40	41	41	33	

Table C1 – Window Sound Insulation Performance Specification

Note: R_{w} is the "overall weighted sound reduction index" tested in a laboratory.

N.B. as the internal noise criteria are expressed in overall terms, other frequency-specific performance levels may ultimately prove acoustically acceptable. Test data for representative samples of all glazing systems shall be submitted to RBA Acoustics for approval to demonstrate compliance with the above performance specifications.

Appendix D – Instrumentation

The following equipment was used for the measurements.

Table D1 – Equipment Calibration Details

	Madat		Calibration			
Manufacturer	Model Type Serial No.		Certificate No.	Expiry Date		
Norsonic Type 1 Sound Level Meter	vel Nor140 1406970		U32886	05 October 2023		
Norsonic Pre Amplifier	1209	21205				
Norsonic ½" Microphone	1225	271055	32885	05 October 2023		
Norsonic Sound Calibrator	1251	35020	U32884	05 October 2023		
Norsonic Type 1 Sound Level Meter	1 Sound Level Nor140 1403127		U37031	11 February 2023		
Norsonic Pre Amplifier	1209A	12071				
Norsonic ½" Microphone	1225 41473		37030	11 February 2023		
Norsonic Sound Calibrator	1251	31986	U37029	11 February 2023		
Norsonic Type 1 Sound Level Meter	nic Type 1 Sound Level Nor140 1403226		U36698	5 January 2023		
Norsonic Pre Amplifier	1209A	12066		,		
Norsonic ½" Microphone	1225	168180	36697	5 January 2023		
Norsonic Sound Calibrator	1251	31988	U36696	4 January 2023		
Norsonic Type 1 Sound Level Meter	rsonic Type 1 Sound Level Nor140 1406116 ter		U36615	17 December 2022		
Norsonic Pre Amplifier	1209	20295				
Norsonic ½" Microphone	1225	344468	36614	17 December 2022		
Norsonic Sound Calibrator	1251	34307	U36613	17 December 2022		

Appendix E – CDM Considerations

The likelihood the harm will occur can be assessed by applying an indicative score (from 1 to 5) as follows:

- 1 Remote (almost never)
- 2 Unlikely (occurs rarely)
- 3 Possible (could occur, but uncommon)
- 4 Likely (recurrent but not frequent)
- 5 Very likely (occurs frequently)

The severity of harm can be assessed by applying an indicative score (from 1 to 5) as follows:

- 1 Trivial (e.g. discomfort, slight bruising, self-help recovery)
- 2 Minor (e.g. small cut, abrasion, basic first aid need)
- 3 Moderate (e.g. strain, sprain, incapacitation for more than 3 days)
- 4 Serious (e.g. fracture, hospitalisation for more than 24 hours, incapacitation for more than 4 weeks)
- 5 Fatal (single or multiple)

The rating value is obtained by multiplying the two scores and is then used to determine the course of action.

Table E1 – Risk Ratings

Rating Bands (Severity x Likelihood)							
Low Risk (1 – 8)	Medium Risk (9 -12)	High Risk (15 – 25)					
May be ignored but ensure controls remain effective	Continue, but implement additional reasonable practicable controls where possible	Avoidance action is required; therefore alternative design solutions must be examined. Activity must not proceed until risks are reduced to a low or medium level					

The following hazards pertinent to our design input have been identified and control measures suggested:

Table E2 – Risk Assessment

Hazard	Dick Of	At Dick		atin	g	Control Mangurag	Controlled		
nazaru		ALRISK	L	S	R		L	S	R
Acoustic glazing - weight	Strain of neck, limbs or back. Fall from height.	Contractors	3	5	15	Provide sufficient manpower, lifting gear and structural support	1	5	5
L: Likelihood S: Seve	erity R: Rating								

Appendix F – Graphs and Site Plans



■ L_{Aeq}

Abbey Area, Phase 3 L_{Amax,f} and L_{A90} Time History

110







■ L_{Amax,f} ■ L_{A90}

Abbey Area, Phase 3

 $L_{A90,15\ minutes}\ Histogram$

Measurement Position 1 - Rear of Site



Graph 3





 $\blacksquare \ L_{Aeq}$

Abbey Area Phase 3

110

 $L_{Amax,f} \, and \, L_{A90} \, Time \, History$

Measurement Position 2 - Overlooking Belsize Road



Project: 9770 Graph 5

■ L_{Amax,f} ■ L_{A90}

Abbey Area Phase 3

L_{A90,15 minutes} Histogram

Measurement Position 2 - Overlooking Belsize Road



Graph 6



07:00 - 23:00

Abbey Area Phase 3 L_{Aeq} Time History Measurement Position 3 - Overlooking Abbey Road





■ L_{Aeq}

Abbey Area Phase 3

110

 $L_{Amax,f} \, and \, L_{A90} \, Time \, History$

Measurement Position 3 - Overlooking Abbey Road





■ L_{Amax,f} ■ L_{A90}

Abbey Area Phase 3 L_{A90,15 minutes} Histogram

Measurement Position 3 - Overlooking Abbey Road



Graph 9





■ L_{Aeq}

Abbey Area Phase 3

110

 $L_{Amax,f}\,and\,\,L_{A90}$ Time History



Measurement Position 4 - Overlooking Belsize Road



Abbey Area Phase 3

 $L_{A90,15\ minutes}\ Histogram$

Measurement Position 4 - Overlooking Belsize Road



Graph 12







Abbey Area, Phase 3 Photo Showing Measurement Position 1 Project 9770 Figure 2 29 April 2022 Not to Scale





Abbey Area, Phase 3 Photo Showing Measurement Position 2 Project 9770 Figure 3 29 April 2022 Not to Scale





Abbey Area, Phase 3 Photo Showing Measurement Position 3 Project 9770 Figure 4 29 April 2022 Not to Scale





Abbey Area, Phase 3 Photo Showing Measurement Position 4 Project 9770 Figure 5 29 April 2022 Not to Scale









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