RBA ACOUSTICS

317 FINCHLEY ROAD
LONDON
NW3 6EP

EXTERNAL BUILDING FABRIC ASSESSMENT

REPORT 7475/EBF
Prepared: 26 January 2018
Revision Number: 1

PMP Construction

External Building Fabric Assessment

317 FINCHLEY ROAD
LONDON
NW3 6EP

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Revision	Comment	Date	Prepared By	Approved By
0	First Issue	23 June 2017	Suzy Everett	Andrew Heath
1	Change of layouts and change of design to concrete frame	26 January 2018	Andrew Heath	Robert Barlow

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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 again will need to be developed in to full working drawings by the lead designer to incorporate all other design disciplines.

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Contents

1.0 INTRODUCTION

The re-development of the building at 317 Finchley Road is proposed. The ground floor is to be converted in to retail space, and the basement to ninth floor will consist of 22 residential units.

The site is located in central London on Finchley Road with retail and residential units to the south, and Finchley Road & Frognal train station to the north. Please also see attached Site Plan 7475/SP1.

An assessment has been carried out in relation to the noise levels likely to be incident on the proposed building façades and to provide acoustic performance specifications such that acceptable internal noise criteria can be achieved.

This report details the results of the noise survey and 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 likely requirements of the Local Authority.

2.0 ENVIRONMENTAL NOISE SURVEY

2.1 Survey Methodology

General

Continuous noise monitoring was undertaken at the re-development site between Wednesday 24th May 2017 and Thursday 25th May 2017 in order to determine the corresponding noise levels over typical day and night-time periods. Weather conditions over the monitoring period were dry with only light wind speeds and were considered suitable for noise monitoring.

Instrumentation

The following instrumentation was used for the survey:

Table 7475/T1 – Equipment Details

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Larson Davis Type 1 Sound Level Meter	SLM824	3153	U22106	12 July 2018
Larson Davis Pre Amplifier	PRM902	4467		
Larson Davis ½" Microphone	2541	8177	22105	12 July 2018
Norsonic Sound Calibrator	1251	34676	U22104	12 July 2018
Norsonic Type 1 Sound Level Meter	Nor140	1406116	U23172	24 November 2018
Norsonic Pre Amplifier	1209	20295		
Norsonic ½" Microphone	1225	215486	23171	24 November 2018
Norsonic Sound Calibrator	1251	34307	U23170	24 November 2018

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

Measurement Positions

Position 1 – Finchley Road

A microphone was positioned 0.25m from the northern façade of the building at second floor level, overlooking Finchley Road. The results at this measurement location are considered to be subject to façade reflection effects.

Position 2 – Finchley Road & Frognal Station

A microphone was positioned on a tripod 2m above the ground at the rear of the site, overlooking Finchley Road and Frognal Station.

The measurement positions are considered to be representative of worst-case noise levels incident on the proposed residential aspects to the rear of the development.

The measurement positions are also shown on the attached Site Plan 7475/SP1.

2.2 Site Conditions

Since the measurements were unattended it is not possible to comment upon the noise climate at each measurement position over the entire monitoring period with absolute certainty.

However, during our time on site it was noted that noise levels at Measurement Position 1 were dominated by road traffic movements along Finchley Road running the length of the northern boundary of the site. The traffic was noted to consist of all types of vehicle and also a busy main bus routes along Finchley Road. The buses are likely to provide the maximum noise levels to the general noise climate to the north and east of the site.

At Measurement Position 2 it was noted that noise levels were affected predominantly by train movements in and out of Finchley Road & Frognal Station. The trains were noted to be passenger trains as well as regular freight trains travelling frequently in both directions.

2.3 Results

The measured L_{Aeq}, L_{A90} and L_{Amax} 15 minute period levels are shown as time-histories on the attached Graphs 7475/G1-4. The averaged daytime and night-time L_{Aeq} noise levels are summarised in the following Table 7475/T2 below.

Table 7475/T2 –Measured L_{Aeq} Noise Levels

Measurement Position	Average Measured $L_{Aeq, period}$ Noise Level (dB)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Position 1 – Finchley Road	71	70
Position 2 – Finchley Road & Frognal Station	58	60

The minimum background noise levels ($L_{A90, 15mins}$) at each measurement position are summarised in the following Table 7475/T3 below. This data can be used to set plant noise emission criteria for use in the assessment of noise emissions from any proposed plant at the development.

Table 7475/T3 – Measured Minimum $L_{A90, 15mins}$ Noise Levels

Measurement Position	Minimum $L_{A90, 15mins}$ Noise Level during period (dB)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Position 1 – Finchley Road	55	54
Position 2 – Finchley Road & Frognal Station	44	37

3.0 PLANT NOISE EMISSION CRITERIA

The requirements of the Local Authority with regards to plant noise emissions, as stated in Planning Condition 37, are as follows:

> *"The external noise level emitted from plant, machinery or equipment at the development hereby approved shall be lower than the lowest existing background noise level by at least 10 dBA, as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity."*

Table 7475/T4 – Plant Noise Emission Limits

Measurement Position	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)
Position 1 – Finchley Road	45	44
Position 2 – Finchley Road & Frognal Station	34	27

In line with BS 4142, should the proposed plant be identified as having intermittent or tonal characteristics, a further penalty should be applied to any of the above proposed noise emission limits in Table 7475/T4.

4.0 EXTERNAL BUILDING FABRIC CRITERIA

The sections below outline the assessment criteria required by the London Borough of Camden and reference additional relevant standards.

4.1 Planning Conditions

Planning Condition 36 of the London Borough of Camden's planning approval document, states:

> *"The noise level in rooms at the development hereby approved shall meet the noise standard specified in BS8233:2014 for internal rooms and external amenity areas."*

4.2 British Standard 8233:2014

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 the following internal ambient noise levels for achieving suitable resting and sleeping conditions within residential properties. A brief explanation of the acoustic terminology used in this report is shown in Appendix A attached.

Table 7475/T5 – BS 8233:2014 Residential Criteria

Room	07:00 to 23:00	23:00 to 07:00
Living Rooms	35 dB $L_{Aeq,16hour}$	--
Dining Room/area	40 dB $L_{Aeq,16hour}$	--
Bedrooms	35dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

4.3 World Health Organisation: Guidelines for Community Noise

The document 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, referred to 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 document.

Table 7475/T6 – Guideline Values for Community Noise

Specific Environment	Critical Health Effect(s)	L_{Aeq} (dB)	Time Base (hours)	$L_{Amax,f}$ (dB)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
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

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 night-time 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 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.

4.4 Summary

The project criteria adopted are therefore as follows;

Bedroom	Night-time (23:00-07:00)	30dB L_{Aeq} 45dB $L_{Amax,f}$
Living Rooms	Daytime (07:00-23:00)	35dB L_{Aeq}

5.0 EXTERNAL BUILDING FABRIC ASSESSMENT

5.1 Background

Analyses of the external building fabric have been undertaken in order to ascertain the required acoustic performance of the glazing and other external fabric elements to achieve the project criteria.

5.2 Assumptions

Our external building fabric analyses have assumed the following:

(a) Drawings

Our assessment has been based on the following Amin Taha architect's proposed general arrangement and elevation drawings.

(b) Noise Levels

The assessment has been based on the measured noise levels as detailed in Section 2.3.

(c) Room Absorption

We have assumed the bedrooms to be acoustically "soft" with carpets, curtains and other soft furnishings. For the purposes of our analyses we have assumed the following absorption coefficients.

Table 7475/T7 – 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

We have assumed the living rooms to be less acoustically absorptive (with a hard floor finish, although with furnishings). For the purposes of our analyses we have assumed the following absorption coefficients.

Table 7475/T8 – Living Room Absorption Coefficients

Absorption Coefficient (a) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
0.15	0.18	0.20	0.22	0.22	0.22	0.23	0.27

(d) External Wall

We understand that external non-glazed areas are to comprise the following:

- Stone cladding or fibre cement boarding
- 50mm cavity
- 100mm thermal insulation board
- 100mm medium density blockwork (minimum 1300 kg/m^3)
- 50mm stud wall with 18mm oak veneered plywood and 25mm mineral wool insulation

As such, we have assumed the following sound reduction indices (equating to an overall R_W of 57dB) for all non-glazed façade areas comprising the above construction:

Table 7475/T9 – Non-Glazed SRIs

Assumed Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
35	40	49	56	58	56	63	65

Should the proposals for non-glazed areas change, it is critical we are informed at the earliest opportunity as this could have a significant impact on the sound insulation performance requirements of the glazing systems.

(e) Ventilation

It is understood the chosen strategy is ventilation through MVHR.

It should be noted that MVHR provide background ventilation only and that windows are to generally be openable to provide rapid ventilation. During those periods where windows are opened for purge/rapid ventilation, noise levels will naturally be increased internally.

5.3 Specification & Guidance Constructions

Appendix B (attached) 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.

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

Please note – *The glazing configurations described in Table 7475/T10 are given for costing purposes only. All window systems should be capable of meeting the performance specifications shown in Appendix B, 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.*

Table 7475/T10 – Glazing Guidance Constructions

Glazing Type	Glazing Configuration
G1	Very High specification double glazing e.g. 10.8mm glass / 20mm cavity / 16.8mm laminated glass
G2	Medium specification thermal double glazing, e.g. 10mm glass/12mm cavity/6mm glass

5.4 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 attached Façade Zoning Plans 7475/FZPB-6.

(i) Zone 1 – Glazing Type: G1

(ii) Zone 2 – Glazing Type: G2

5.5 Flanking Specification

We understand there are no curtain walling or continuous glazing systems be proposed for the development.

5.6 External amenity Areas

BS8233:2014 outlines the following guidance in relation to external noise in amenity areas.

> *"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*
>
> *Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB LAeq,T or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."*

From the above it can be seen that for larger roof terraces, a target noise level <55 dBA would be ideal in at least some areas of the roof.

We have assessed the likely levels of noise in the centre of the terraces on the basement level gardens, and fifth and seventh floors of the development, the results of which are outlined below.

Basement Level Gardens – 49 dBA
Fifth Floor Terrace – 48 dBA
Seventh Floor Terrace – 54 dBA

Noise levels on the fifth and seventh floor roof terraces for the busiest time of day are predicted to be below 55 dBA and considered in line with the ideal noise levels outlined in BS8233.

6.0 CONCLUSION

RBA Acoustics have undertaken noise monitoring at the proposed development site at 317 Finchley Road, London. The measured noise levels are presented herein. The resultant noise levels have been used in our assessment of the glazing requirements to ensure suitable internal noise levels are achieved at the proposed development with reference to BS 8233 and WHO.

General guidance configurations have been suggested for the glazing constructions that should be capable of achieving the required specifications detailed within Appendix B to ensure compliance with Planning Condition 36 for the scheme. A worst case example configuration of 10.8/20/16.8 double glazing is required in the worst affected bedrooms to protect the residences from any potential noise impact arising from external noise intrusion. However, other areas only require more standard double glazing.

The data has also been used to set plant noise emission criteria for future assessment of any proposed plant at the development in line with the Local Authority requirements.

Appendix A - Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g. L_{A10}, L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

Appendix B – External Building Fabric Acoustic Specification

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:

Type	Minimum Recommended Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)								R_w (dB)
	63	125	250	500	1k	2k	4k	8k	
G1	24	28	32	43	46	48	55	55	45
G2	22	26	27	34	40	38	46	46	38

Note: R_W is the "overall weighted sound reduction index" tested in a laboratory.

N.B. as the internal noise criteria are expressed in dBA 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 C – CDM Considerations

Having identified the hazards, a more detailed assessment of risk is necessary in order that the appropriate action may be taken. A precise estimate of risk is neither practical nor required.

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 > 3 days)
4 – Serious (e.g. fracture, hospitalisation > 24 hrs, incapacitation > 4 weeks)
5 – Fatal (single or multiple)

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

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:

Hazard	Risk Of	At Risk	Rating			Control Measures	Controlled		
			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: Severity
R: Rating

317 Finchley Road, London

L_{Aeq} Time History

Measurement Position 1, Wednesday 24 May to Thursday 25 May 2017

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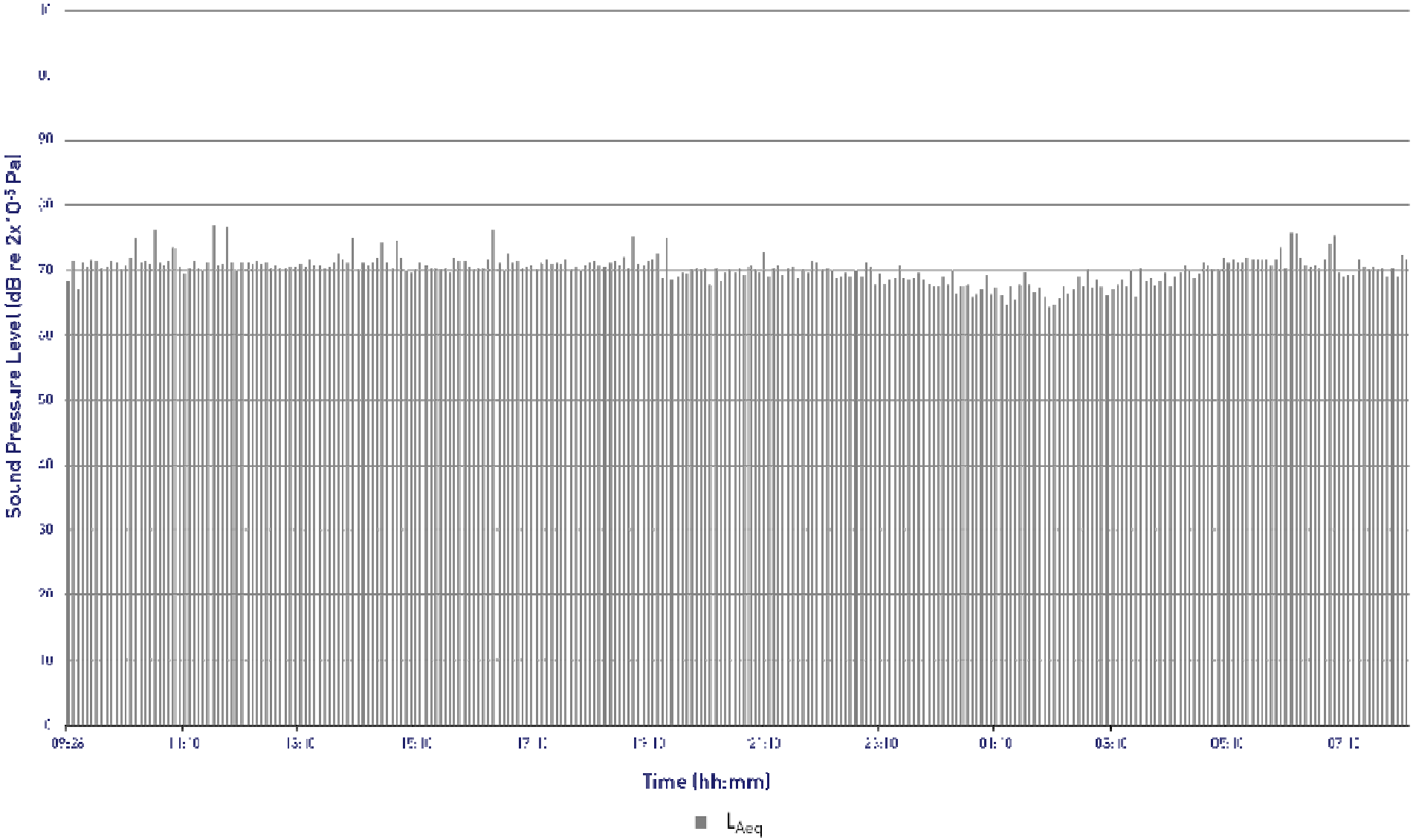
Graph 7475/G1



317 Finchley Road, London

L_{Aeq} Time History

Measurment Position 2, Wednesday 24 May to Thursday 25 May 2017

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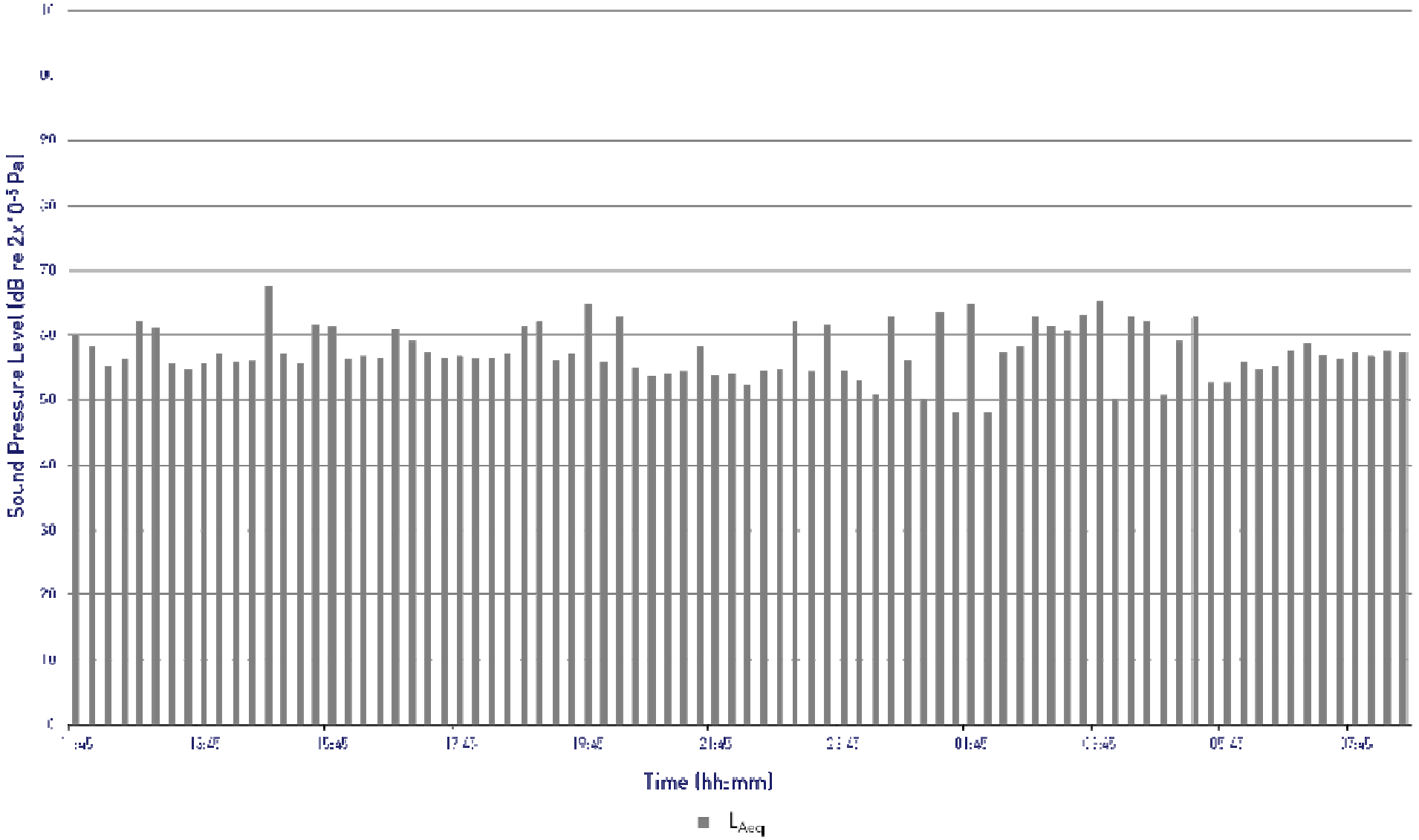
Graph 7475/G2



317 Finchley Road, London

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

Measurement Position 1, Wednesday 24 May to Thursday 25 May 2017

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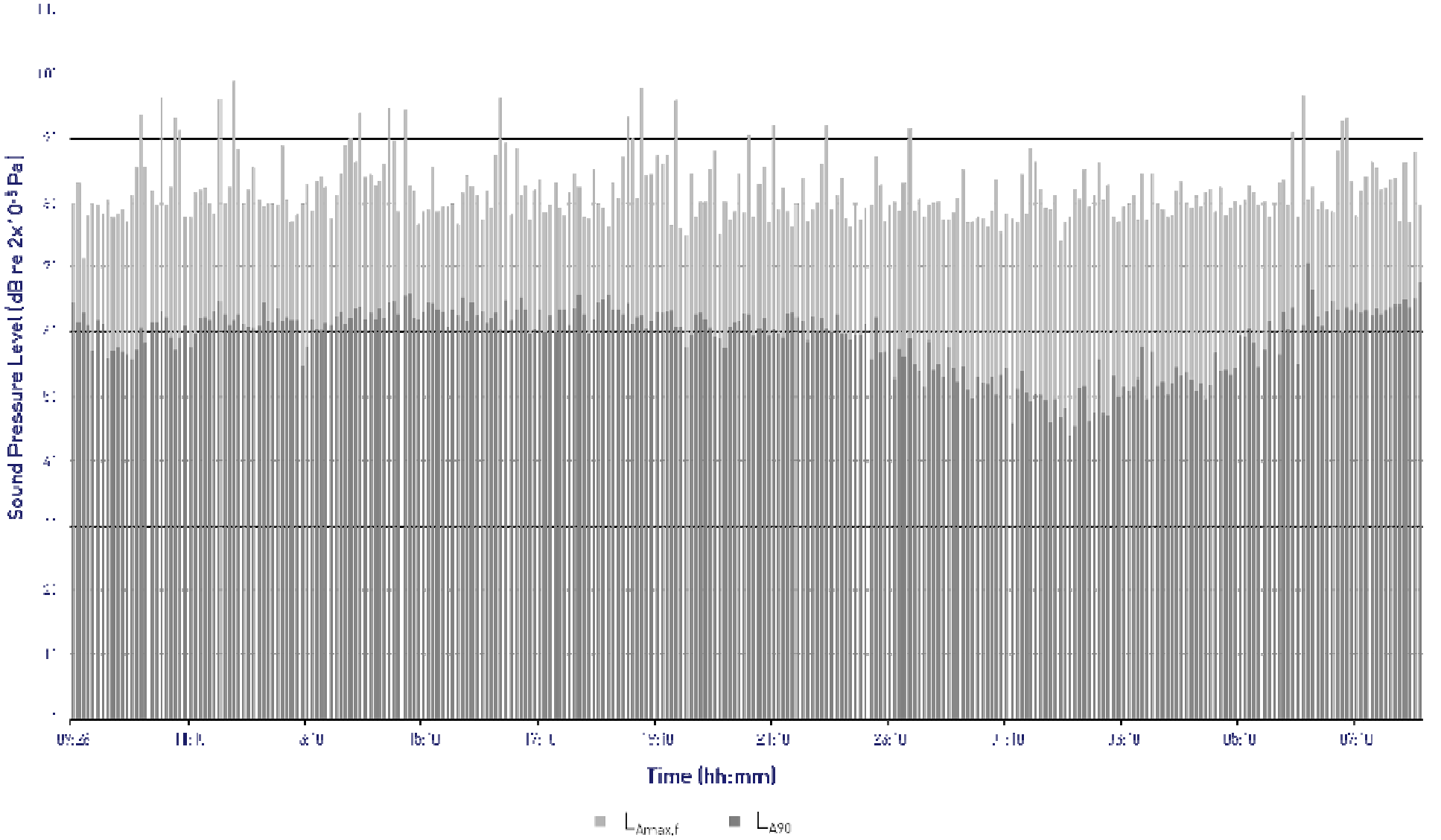
Graph 7475/G3



317 Finchley Road, London

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

Measurment Position 2, Wednesday 24 May to Thursday 25 May 2017

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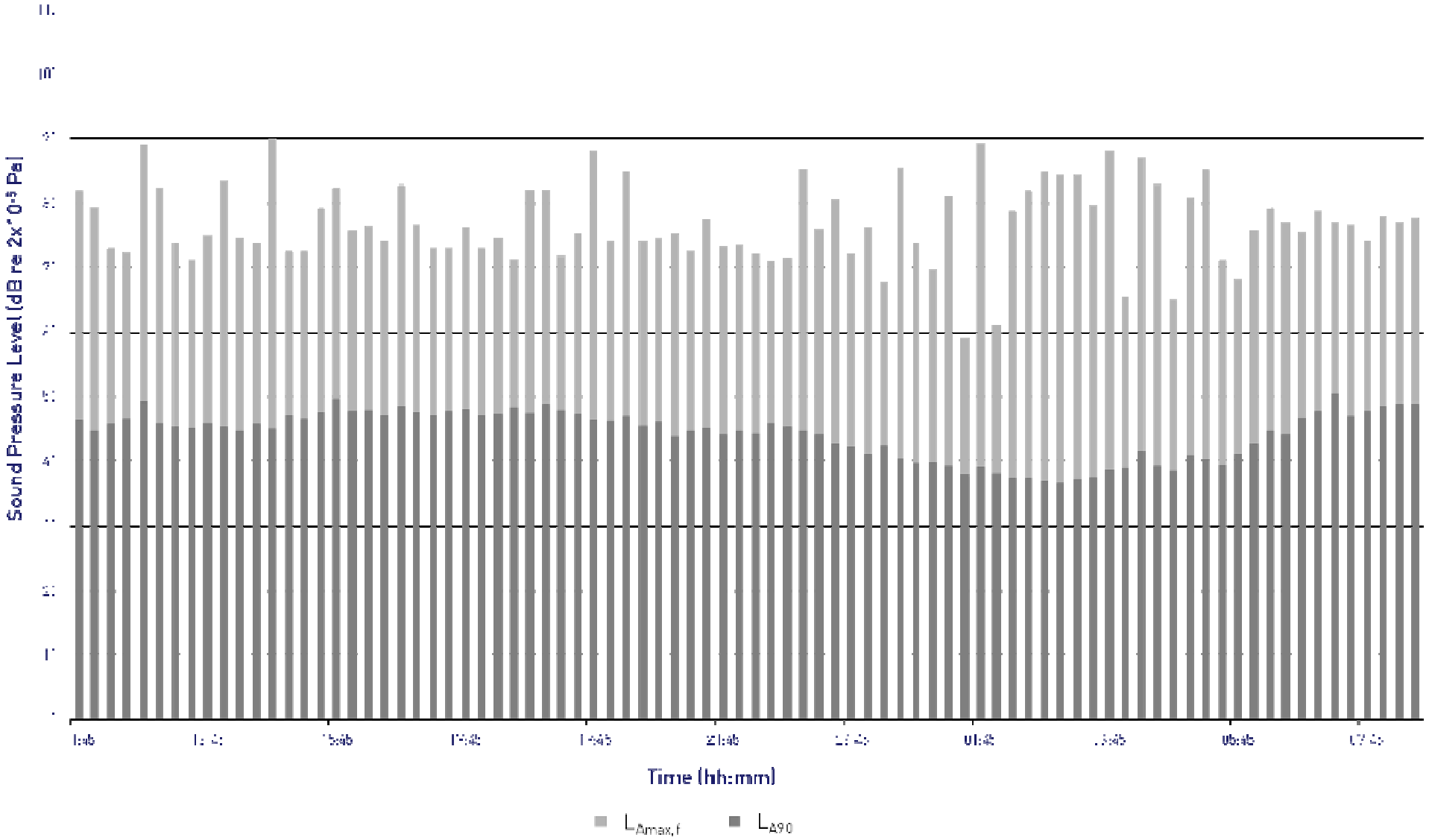
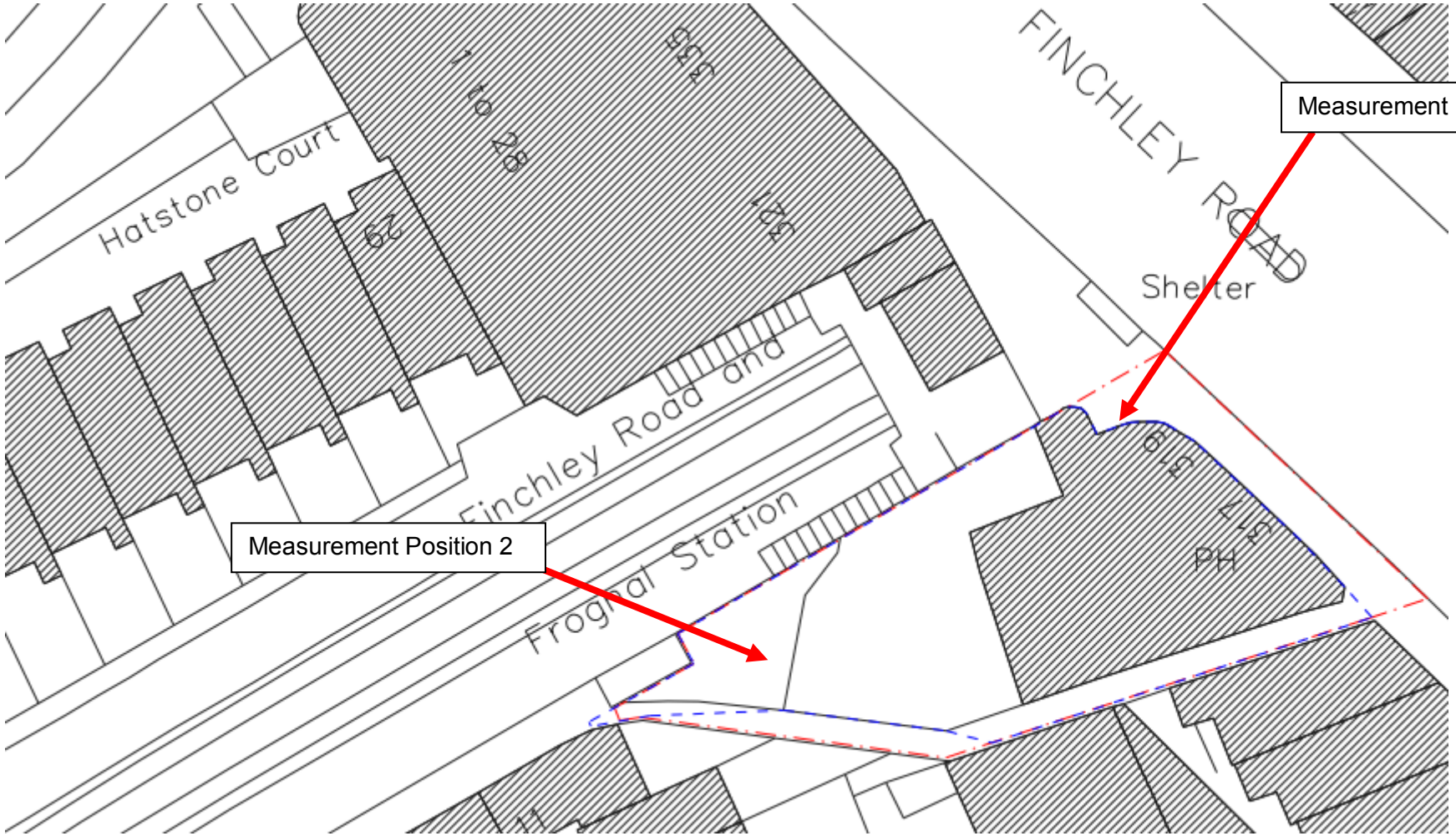
Graph 7475/G4





317 Finchley Road, London

Site Plan Showing Measurement Positions

Site Plan 7475/SP1

Not to Scale

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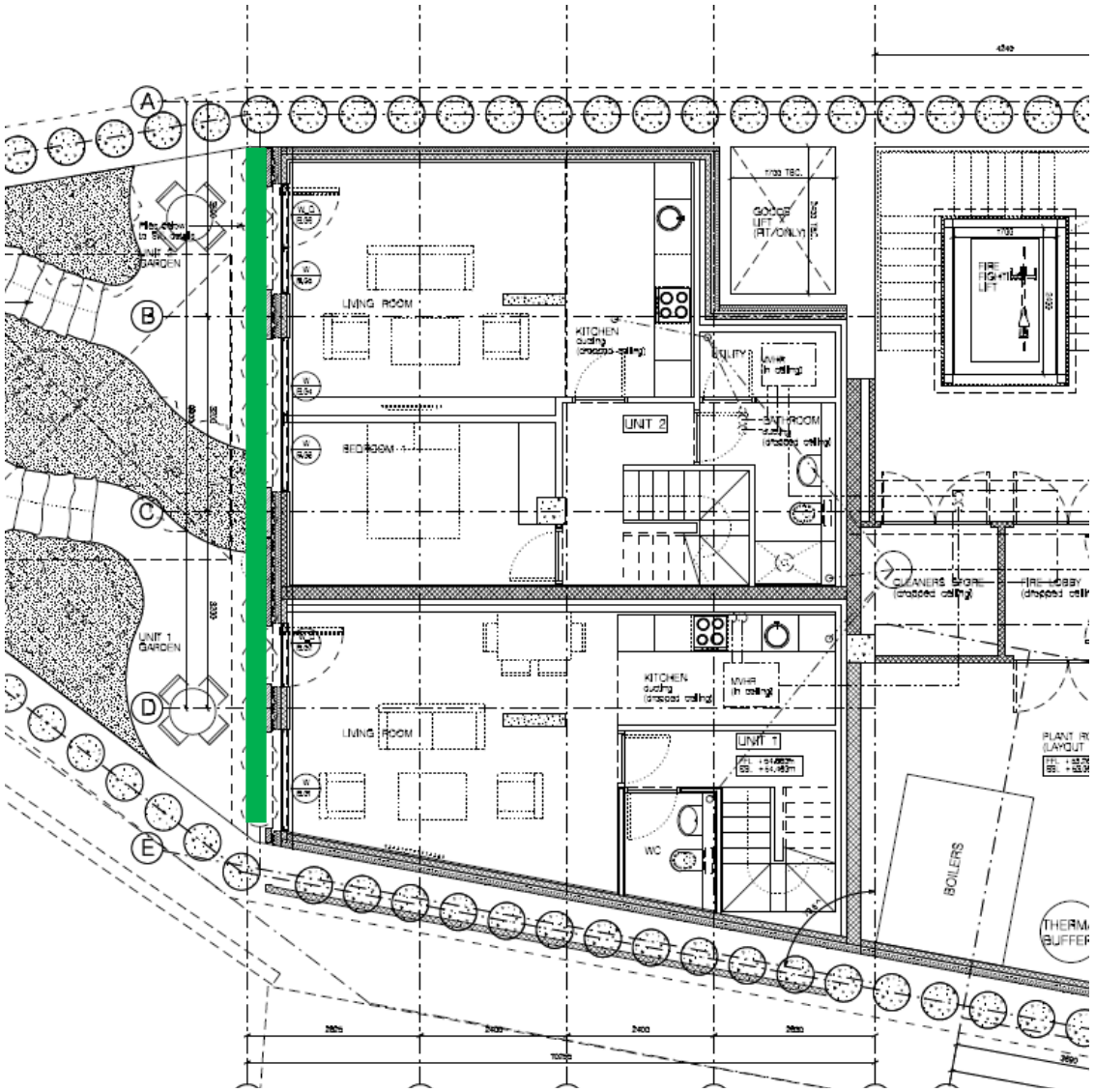


Key:	
Zone 1:	
Zone 2:	

:

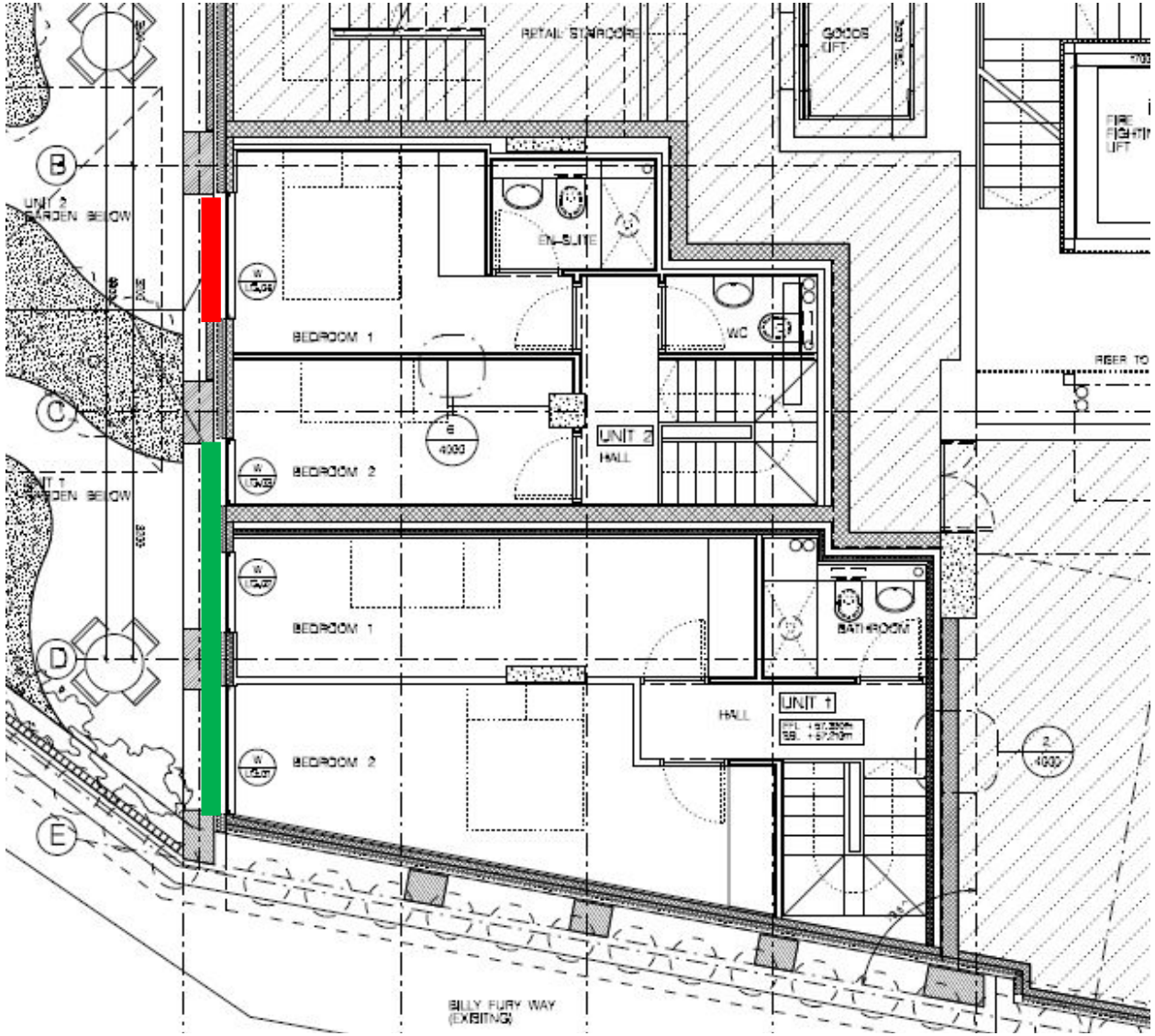
317 Finchley Road, London

Façade Zoning Plan – Basement

7475/FZPB

Not to Scale

RBA ACOUSTICS



Key:	
Zone 1:	
Zone 2:	

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317 Finchley Road, London

Façade Zoning Plan – Lower Ground Floor

7475/FZPG

Not to Scale

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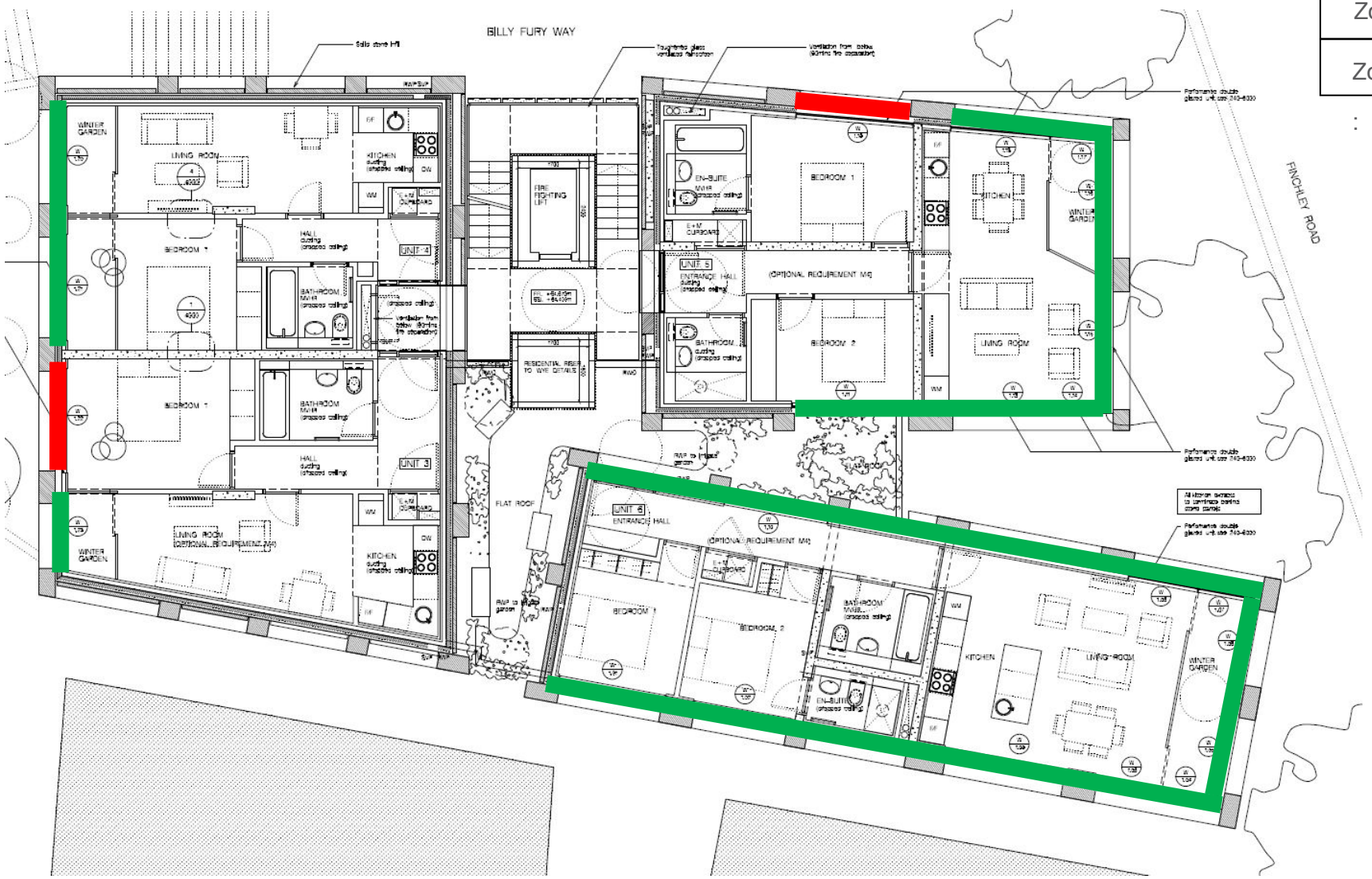


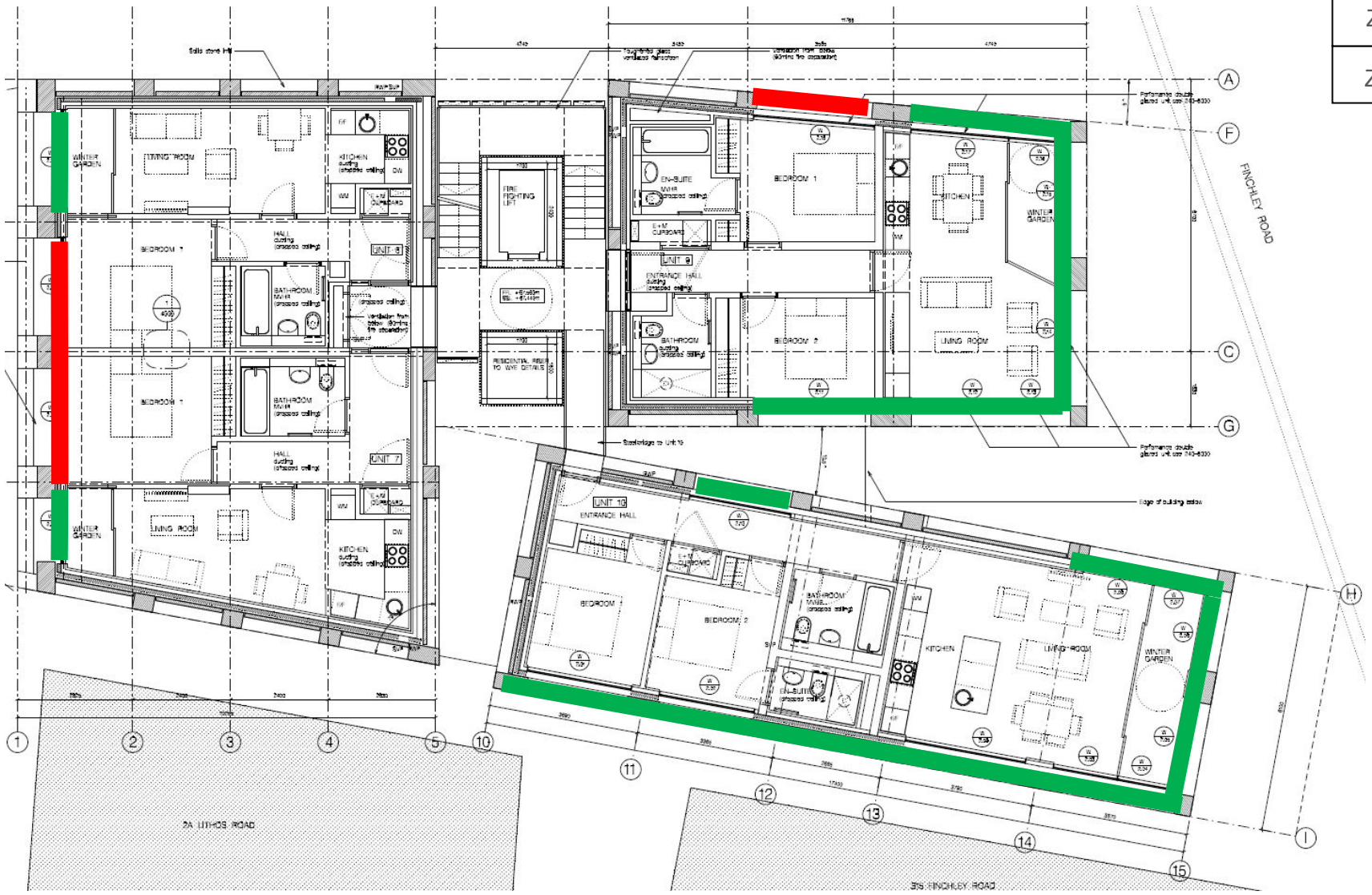
317 Finchley Road, London

Façade Zoning Plan – First Floor

7475/FZP1

Not to Scale

RBA ACOUSTICS



317 Finchley Road, London

Façade Zoning Plan – Second Floor

7475/FZP2

Not to Scale

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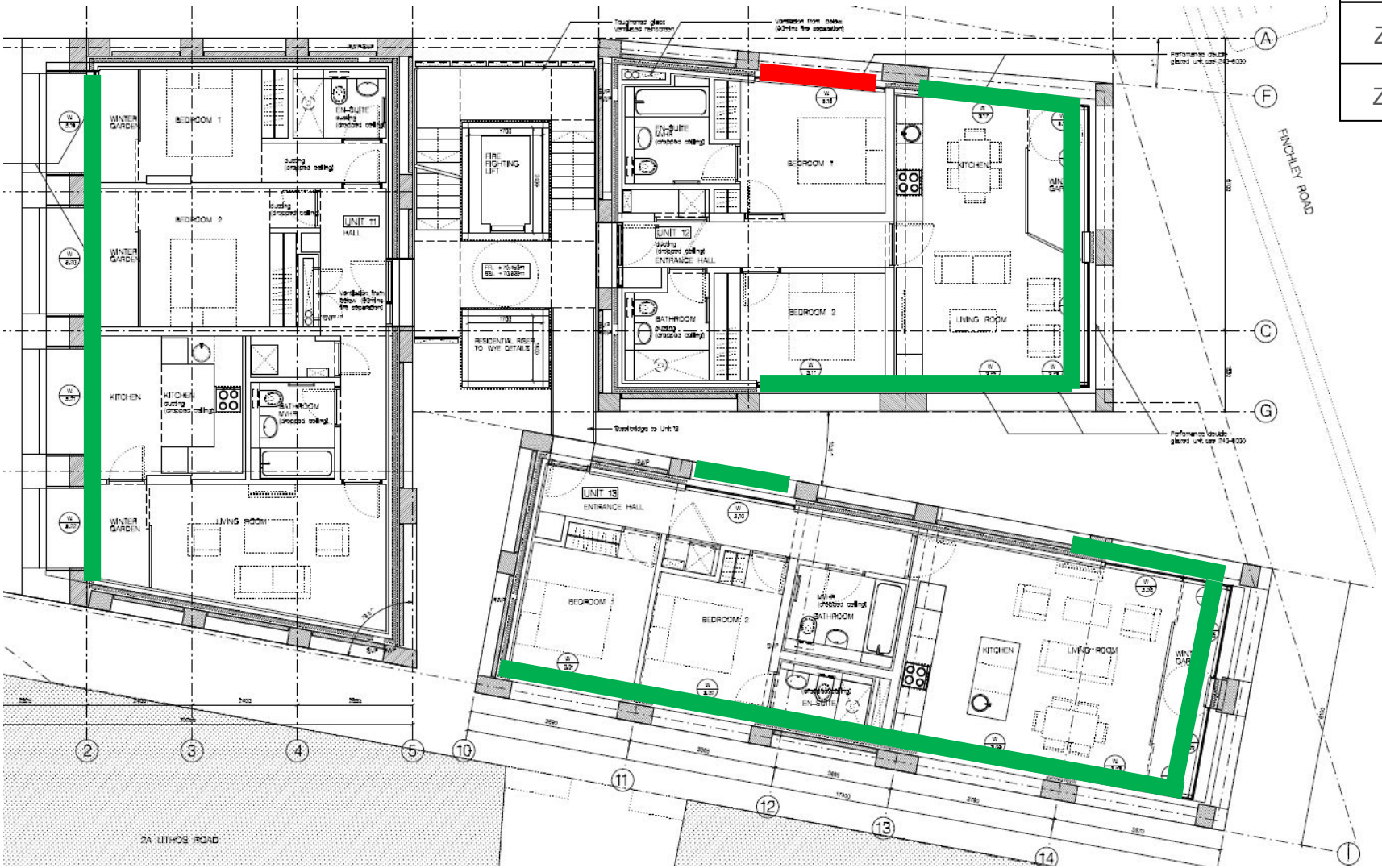

317 Finchley Road, London

Façade Zoning Plan – Third Floor

7475/FZP3

Not to Scale

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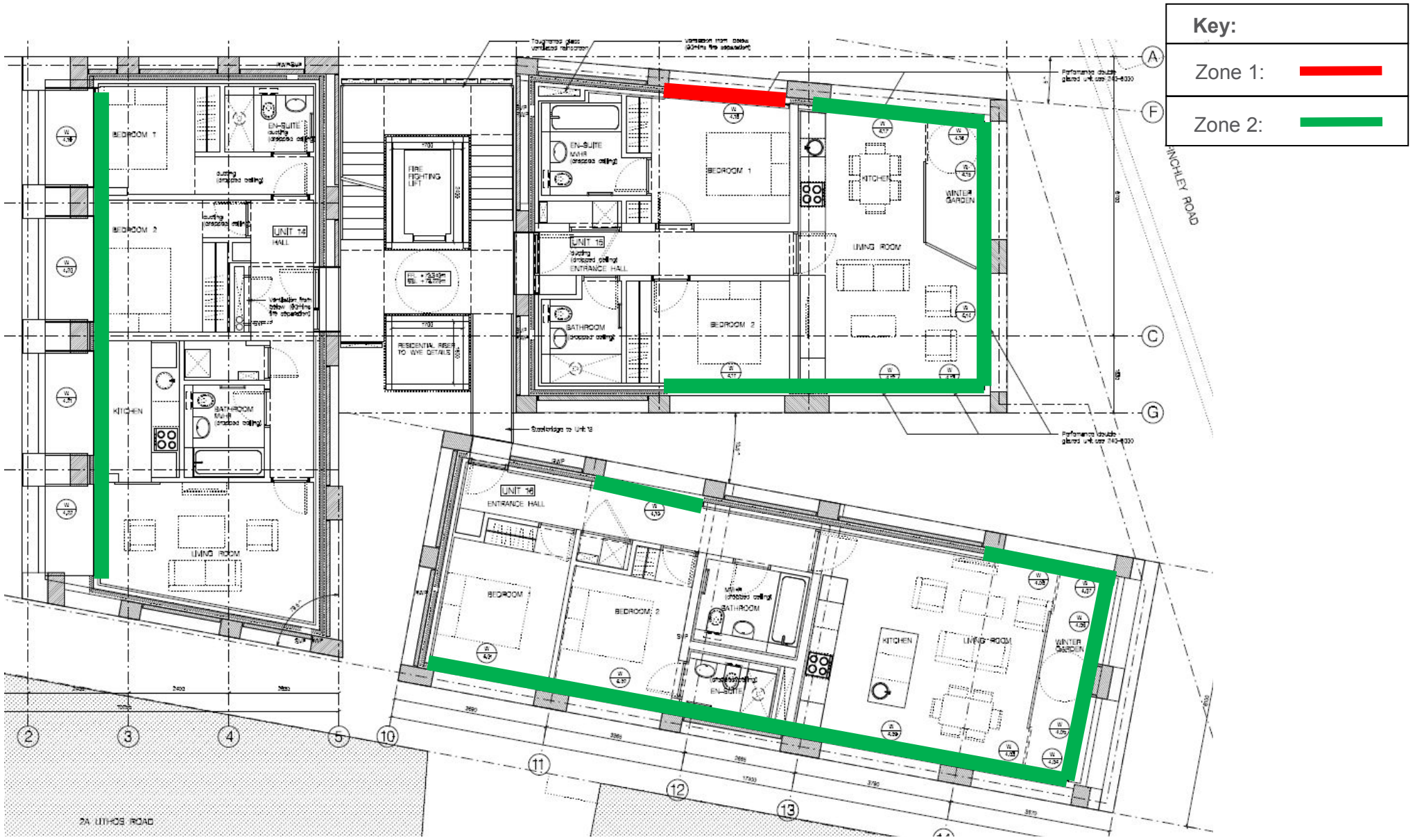

317 Finchley Road, London

Façade Zoning Plan – Fourth Floor

7475/FZP4

Not to Scale

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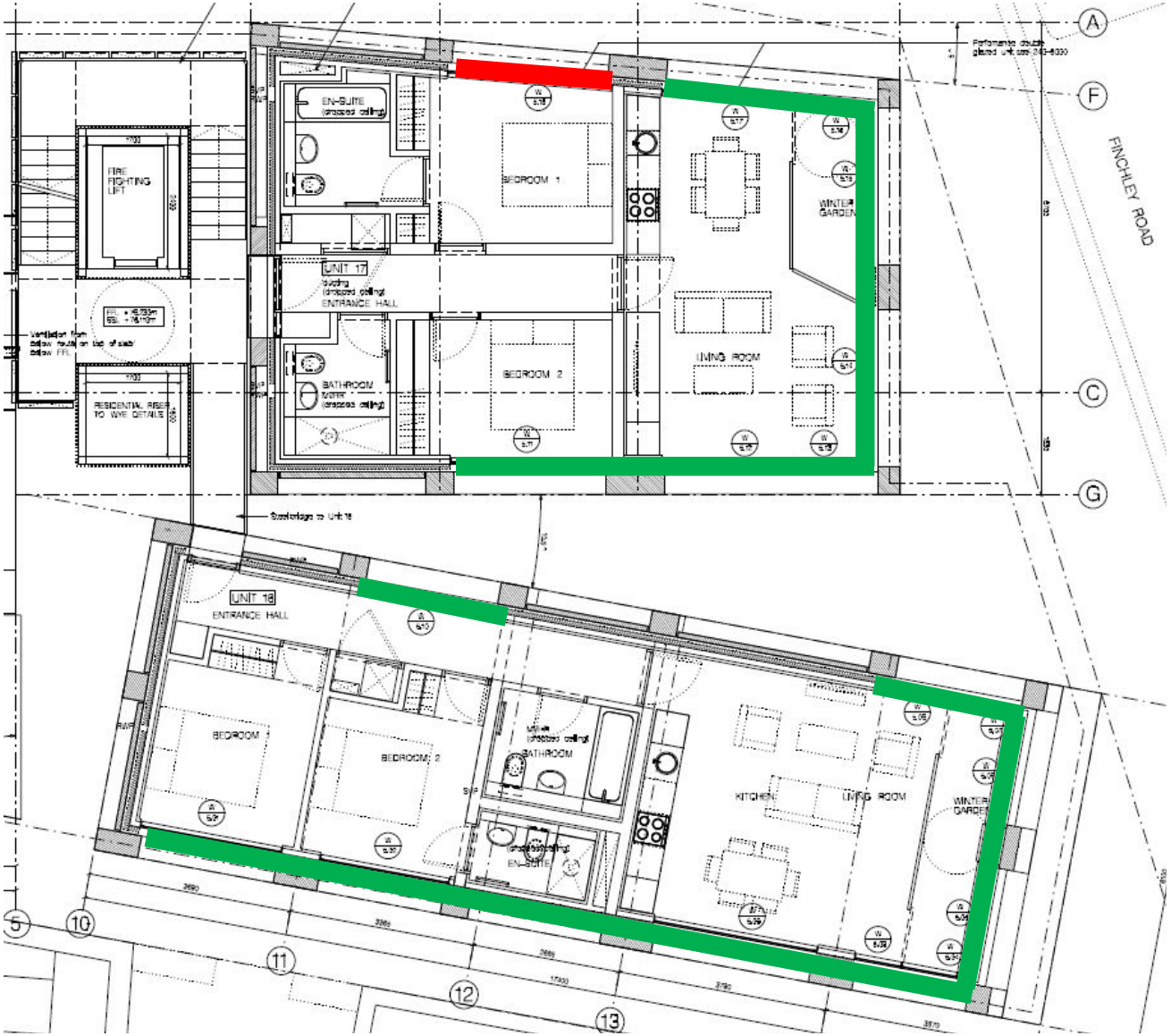


Key:	
Zone 1:	
Zone 2:	

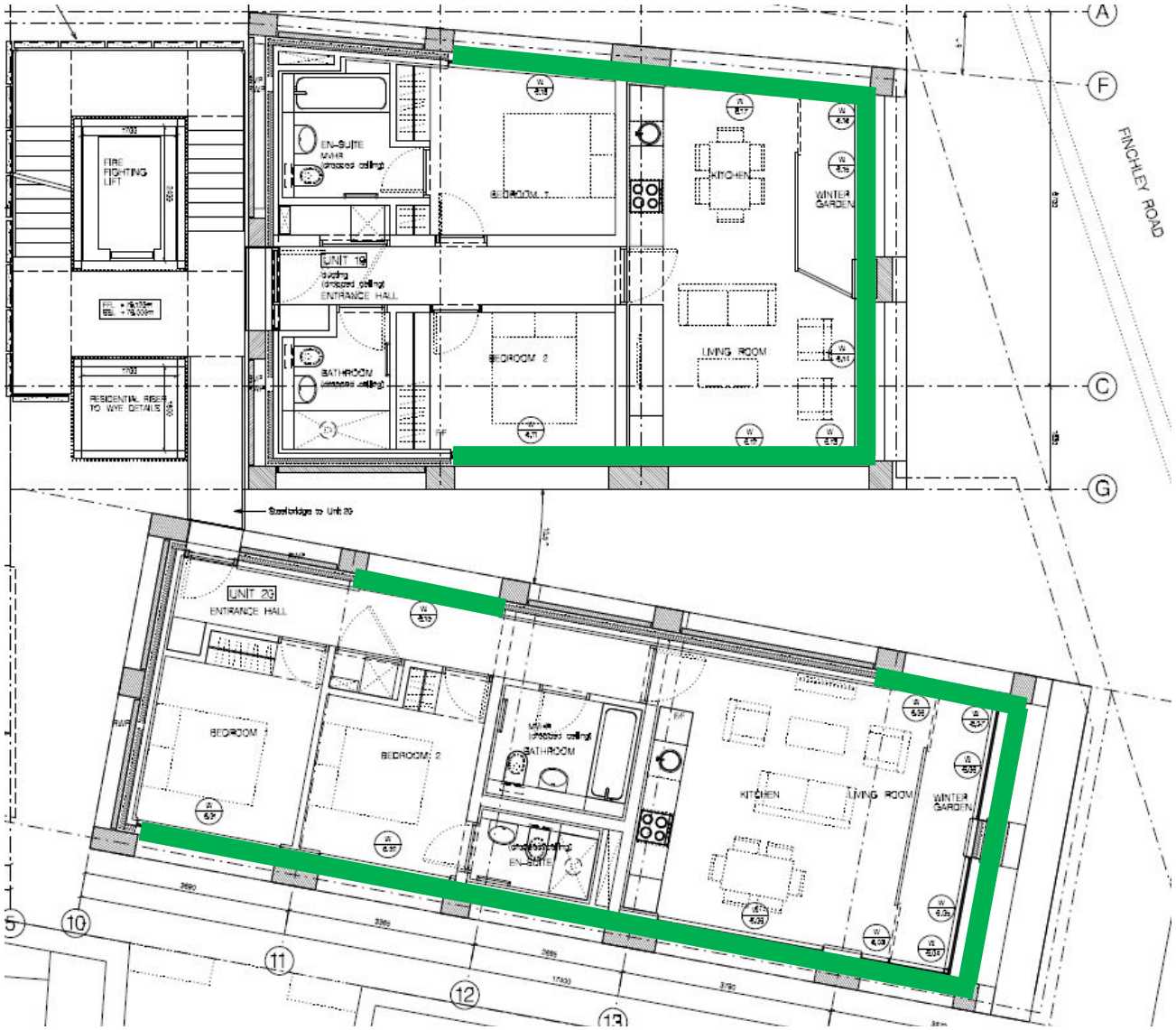
317 Finchley Road, London

Façade Zoning Plan – Fifth Floor

7475/FZP5

Not to Scale

RBA ACOUSTICS



Key:	
Zone 1:	
Zone 2:	

317 Finchley Road, London

Façade Zoning Plan – Sixth to Ninth Floors

7475/FZP6

Not to Scale

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317 Finchley Road, London

Finchley Road

Photograph detailing measurement position 1

Measurement Position 1

7475/P1

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317 Finchley Road, London

Finchley Road & Frognal Station

Photograph detailing measurement position 2

Measurement Position 2

7475/P2

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