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AAD
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HYLANDS ROAD, WALTHAMSTOW

LONDON

SITE NOISE SURVEY

and

EXTERNAL BUILDING FABRIC ASSESSMENT

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1.0 Introduction

1.1 A new residential development is proposed to be constructed on an existing residential site on Hylands Road in Walthamstow, London.

1.2 A noise level survey has been undertaken at the site in order to establish the prevailing noise climate during the daytime and night-time periods.

1.3 The measured noise levels have been used to complete an external building fabric sound insulation assessment. The assessment determines the required acoustic performance of the building façade and windows in order to achieve the recommended levels for internal ambient noise set out in BS8233:2014. The assessment methodology, results and recommendations are set out below.

2.0 Site Description

2.1 The site is located on Hylands Roads in Upper Walthamstow and currently contains existing two storey council housing and a disused community centre.

2.2 To the north of the site is the A503 Forest Road and further to the north the A406 N Circular. To the east of the site is Epping Forest and to the south east are Allotments within Epping Forest. Residential terraced housing is located to the north and west of the site.

2.3 The proposed scheme comprises the erection of four blocks of newly built residential flats to replace the existing buildings. Block A is proposed to be 6 storeys, Block B 5 storeys, Block C 8 storeys and Block D 6 storeys and each block will provide a mix of 1, 2 and 3 bedroom flats. See Appendix 1 for a site location plan.

3.0 Criteria

3.1 BS8233:2014

3.1.1 The internal ambient noise level guideline criteria for residential dwellings given in BS8233:2014 are as shown in Table 3 below.

Table 1: BS8233 Internal Noise Criteria

Location	07:00 to 23:00	23:00 to 07:00
Living/dining room	35 dB $L_{Aeq,16hour}$	n/a
Dining room/area	40 dB $L_{Aeq,16hour}$	n/a
Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

3.1.2 Note 7 from BS8233 also states that where development is considered necessary or desirable, despite external noise levels above WHO Guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

3.1.3 The guidance also states, in regard to noise levels in external amenity spaces, that it is desirable that external noise levels do not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. It is however also recognised that these guideline values are not achievable in all circumstances where development might be desirable.

3.2 BS 8233 states that a guideline value for maximum instantaneous nosie may be set at night but does not provide any numerical criteria. The World Health Organisation (WHO) guidance states that sound pressure levels exceeding approximately 45 dB L_{Amax} more than 10-15 times per night may cause sleep disturbance. This is therefore considered an appropriate night time L_{Amax} criteria.

4.0 Noise Survey & Results

4.1 As the site is not secure attended daytime and night noise surveys were undertaken. The primary measurement location was towards the north western corner of the development site and additional sample measurements were taken around the site, see Appendix 1 for the site plan and measurement locations.

4.2 Instrumentation: An NTi Audio XL2 Type 1 sound level meter (Serial No. AZA 10121) and Norsonic 140 Class 1 integrating sound level meters, serial 6388 and 3194 with associated pre-amplifier and microphone. The instrument was checked for correct calibration prior and subsequent to use whereupon no calibration drift was recorded. The instrument was used in accordance with the manufacturer's instructions.

4.3 Location: The sound level meter was mounted on a tripod approximately 1.5m from the local ground, in a location representative of the proposed buildings facades.

4.4 Periods: Day time noise level monitoring was undertaken between approximately 10:00 hrs and 13:00 on Thursday 4th July 2019. Night time noise level monitoring was undertaken between approximately 23:00 hrs on Thursday 4th July to 00:30 on Friday 5th July 2019. The primary monitor was configured to log noise levels in 1 hour and 1 minute intervals and the additional monitors were configured to log noise levels in 15 minute intervals.

4.5 Weather: The weather conditions prevailing during the survey period were mostly clear skies and dry. Wind speed was understood to be less than 5 m/s throughout the survey period, based upon local historical weather data.

4.6 Site Noise Characteristics: The ambient noise climate is controlled by noise from road traffic on the surrounding roads. It is understood that no unusual events occurred during the survey period.

4.7 Surveyor(s): Jessica Niemann MIOA and Adam Slaymark

4.8 Daytime

4.8.1 The daytime survey was undertaken in accordance with the short term monitoring procedure set out in the Memorandum on the Calculation of Road Traffic Noise (CRTN).

4.8.2 This procedure is that the $L_{A10,\ 18\ hr}$ noise level can be determined by arithmetically averaging three $L_{A10,\ 1\ hr}$ measured noise levels carried out during the period 10:00 to 17:00 on any weekday between Tuesday and Thursday and subtracting 1 dB. Previous planning guidance PPG 24 included a correction factor to convert an $L_{A10,\ 18hr}$ into the value of $L_{Aeq,\ 16hr}$ (0700-2300).

The value of $L_{Aeq,\ 16hr}$ for the measurement location can be evaluated, based upon the data shown in Table 1, as follows;

Table 2: Measured daytime $L_{A10, 1hr}$ values

Time Period	Measured Levels
10:00 – 11:00	52.3 dB $L_{A10, 1hr}$
11:30 – 12:30	54.5 dB $L_{A10, 1hr}$
12:30 – 13:30	52.4 dB $L_{A10, 1hr}$

Three consecutive hourly values of $L_{A10, 1hr}$ are 52, 55 and 52
Arithmetic average value = 53 dB
Value of $L_{A10, 18hr}$, as per CRTN = 53 –1.0 = 52 dB
Value of $L_{Aeq, 16hr}$, as per PPG24 = 52 – 2.0 = **50 dB**

4.9 Night-time

4.9.1 There is no approved procedure for evaluating levels of night-time noise, $L_{Aeq, 8hr}$, from measurements made in shorter periods. AAD have, however, published a paper into the study of this subject, which found that a close approximation can be made from measurement of $L_{Aeq, 1hr}$ in any one hour, and adding a correction factor (dependent upon the actual hour within which the short period measurement was made) to give an estimated eight hour value. It is acknowledged that this approach has no formal standing, however it is considered to provide an acceptable approximation for the purposes of this study.

4.9.2 The value of $L_{Aeq, 1hr}$ was measured in the period from 23:00 to 00:00. Background noise levels would normally decrease beyond this time, to around 04:00, when they would start to increase again. Based upon the published paper, the appropriate correction for $L_{Aeq, 1hr}$ between 23:00 to 00:00 to $L_{Aeq, 8hr}$ is considered to be the deduction of 1.3 dB with a standard deviation of 0.9 dB.

4.9.3 Based upon the measured noise levels, the estimated value of $L_{Aeq, 8hr}$ at the measurement location is therefore;

Value of $L_{Aeq, 1hr}$ between 20:30 and 00:00 was 54.6 dB
$L_{Aeq, 1hr}$ 54.6 – 4 dB distance correction between MP5 and façade location = 50.6 dB
50.6 – 1.3 = $L_{Aeq, 8hr}$ 49.3 dB = **50 dB***
*allows +2 standard deviations for measurement uncertainty

4.9.4 During the night measurements the highest measured $L_{Amax, fast}$ noise level was 81 dB and is considered to be a worst case representation. The World Health Organisation (WHO) guidance on night time noise is based upon "*regularly occurring*" events, where up to ten exceedances per 8 hour night-time period are allowed. As a worst case, given the one hour measurement period, it has been taken that this should form the basis for the façade break in calculations. Applying the 4 dB distance correction between MP5 and the façade location results in a night time maximum noise level of 77 dB $L_{Amax, fast.}$

4.10 The overall baseline site design noise levels, based upon the survey data, can therefore be summarised as follows;

Table 3: Derived site noise levels at north facing façade location

Calculated Noise Levels		
Daytime	Night-time	
$L_{Aeq, 16hr}$ 50 dB	$L_{Aeq, 8hr}$ 50 dB	$L_{Amax, fast}$ 77 dB

5.0 Development Assessment

5.1 Based upon the measured noise levels, the design noise levels applicable to each façade around the proposed development are shown below in Tables 4 to 7 below.

Table 4: Block A & B North, East & West Façade Incident Noise Levels

Index	octave band centre frequency (Hz)							dBA
	63	125	250	500	1k	2k	4k	
	sound pressure level, dB re $2x10^{-5}$ Pa							
Daytime, $L_{Aeq,16hr}$	61	54	49	45	46	41	34	50
Night-time, $L_{Aeq,8hr}$	59	50	45	44	48	42	37	50
Design, $L_{AFmax,\ night}$	84	70	61	59	75	72	75	77

Table 5: Block A & B South Façade Incident Noise Levels (-5 dB for screening)

Index	octave band centre frequency (Hz)							dBA
	63	125	250	500	1k	2k	4k	
	sound pressure level, dB re $2x10^{-5}$ Pa							
Day, $L_{Aeq,16hr}$	56	49	44	40	41	36	29	45
Night, $L_{Aeq,8hr}$	54	45	40	39	43	37	32	45
Design, $L_{AFmax,\ night}$	83	69	60	58	74	72	74	76

Table 6: Block C Façade Incident Noise Levels (-6 dB for distance)

Index	octave band centre frequency (Hz)							dBA
	63	125	250	500	1k	2k	4k	
	sound pressure level, dB re $2x10^{-5}$ Pa							
Daytime, $L_{Aeq,16hr}$	55	48	43	39	40	35	28	44
Night-time, $L_{Aeq,8hr}$	53	44	39	38	42	36	31	44
Design, $L_{AFmax,\ night}$	82	68	59	57	73	71	73	75

Table 7: Block D Façade Incident Noise Levels (-8 dB for distance)

Index	octave band centre frequency (Hz)							dBA
	63	125	250	500	1k	2k	4k	
	sound pressure level, dB re $2x10^{-5}$ Pa							
Day, $L_{Aeq,16hr}$	53	46	41	37	38	33	26	42
Night, $L_{Aeq,8hr}$	51	42	37	36	40	34	29	42
Design, $L_{AFmax,\ night}$	80	66	57	55	71	69	71	73

5.2 It should be noted that the values in tables 4 to 7 have been corrected from the measured values at the measurement location to take account of acoustic screening and/or additional distance from the road of the proposed buildings. The correction factor is based upon sample measurements taken at measurement position 2, 3 and 4 as shown on the site plan in Appendix 1. The resultant corrections that have been applied are 5 dB reduction allowed for screening for the rear façade of Block A, a 6 dB reduction allowed for the additional distance attenuation to the location of Block C and an 8 dB reduction allowed for the additional distance attenuation to the location of Block D.

5.3 Typically, a partly open window is seen to provide up to a 15 dB reduction to the external façade noise levels. It is therefore likely that the internal maximum night time noise levels will be exceeded with opened windows, and therefore ventilation to bedrooms should will require use of acoustic trickle vents.

5.4 Based upon the daytime levels presented above, and the assumption of a 15 dB reduction from an opened window, it is likely that the daytime internal noise criteria can be achieved without use of an acoustic trickle vent, and therefore they may be considered unnecessary to living and/or dining rooms.

5.5 The calculated minimum sound insulation performance requirements for façade elements are given in the following table. These values are based on the noise levels as given above, and targeting the internal ambient noise levels given in BS8233 and night time maximum noise level given in WHO Guidelines.

Table 5: Window and Ventilation Specification

Location	Facade	Roof	Windows		Vents to Bedrooms	
			Sound Insulation	Type	Sound Insulation	Type
Block A & B North, East & West Façades	R_W 45 dB	R_W 38 dB	R_W 38 dB	6-12-10mm Glazing	$D_{n,e,w}$ 40 dB	Acoustic Trickle Vent
Block A & B South Façades and Block C			R_W 38 dB	6-12-10mm Glazing	$D_{n,e,w}$ 37 dB	Acoustic Trickle Vent
Block D			R_W 36 dB	4-12-10mm Glazing	$D_{n,e,w}$ 35 dB	Acoustic Trickle Vent

5.6 Calculations with respect of break in noise have been carried out based upon the assumption of a typical residential room reverberation time of 0.5 seconds.

5.7 A more detailed acoustic performance specification for the windows and vents are set out in Appendix 2 and Appendix 3.

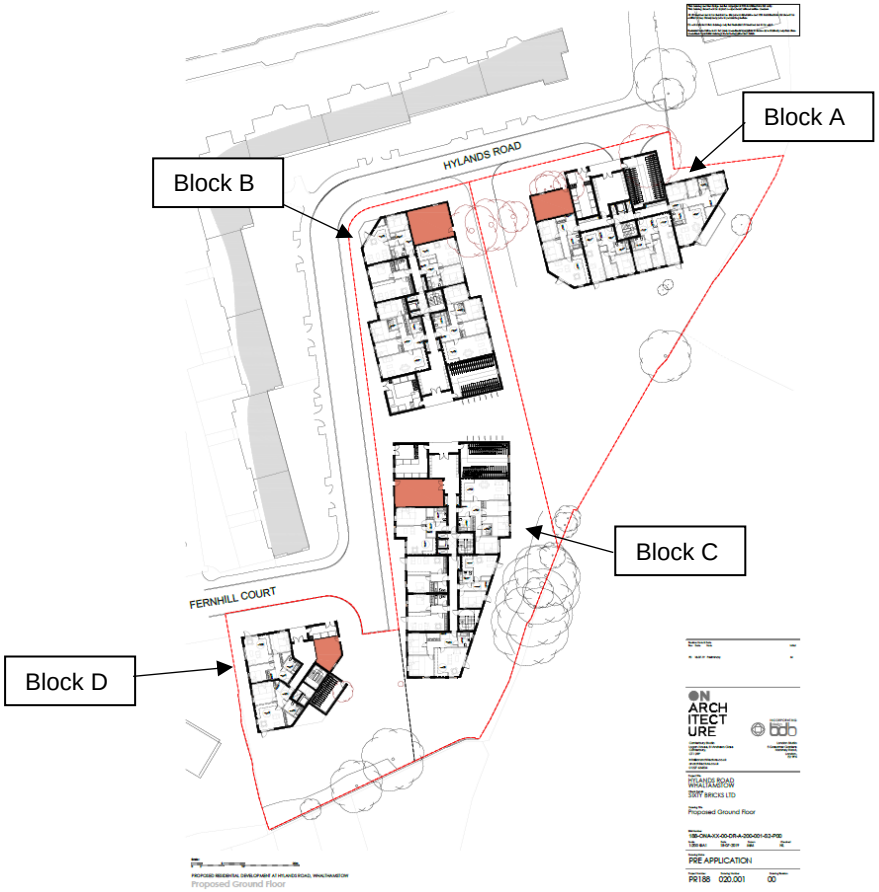
6.0 Summary and Conclusion

6.1 Attended noise surveys have been carried out at the site of the proposed residential development on Hylands Road in Walthamstow, London, to establish the daytime and night ambient $L_{Aeq,\,t}$ noise levels and $L_{Amax,\,fast}$ noise levels at night.

6.2 Building envelope sound insulation requirements have been determined with regard to the relevant guidance in BS8233:2014 and WHO Guidelines for internal noise levels, and appropriate acoustic performance specifications for windows and vents have been provided.

6.3 It is concluded that with the minimum window and vent acoustic specifications as indicated, the internal noise levels recommended in BS8233 and WHO Guidelines may be achieved.

Appendix 1: Site Location Plan



Appendix 2: Minimum Window Acoustic Specifications

1.0 Windows, including all glazed elements, fixed and openable sections, related framework, mullions, transoms and, where applicable, furniture, all as are intended to be included within any part of the building façade, shall provide an airborne sound reduction performance of not less than the following;

Façade	**octave band centre frequency (Hz)**							**R_w, dB**
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	
	sound reduction index, R, dB							
Block A & B North, East & West Façades	22	26	27	34	40	38	46	38
Block A & B South Façades and Block C	22	26	27	34	40	38	46	38
Block D	21	25	22	33	40	43	44	36

2.0 Performance shall be as measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1:1997, and evidence to this effect shall be published as part of the tender response.

Appendix 3: Minimum Ventilator Acoustic Specifications (where required)

1.0 Window frame trickle ventilators, including all fixed and openable sections and related framework, all as are intended to be included within any part of the building façade, shall provide a sound reduction performance of not less than the following (with the vent in the "open" position);

Façade	octave band centre frequency (Hz)							$D_{n,e,w}$ dB
	63	125	250	500	1k	2k	4k	
	sound insulation, $D_{n,e}$, dB							
Block A & B North, East & West Façades	36	36	37	37	40	42	42	40
Block A & B South Façades and Block C	36	36	37	37	34	37	37	37
Block D	36	36	35	35	34	34	36	35

2.0 Performance shall be as measured in accordance with BS EN 20140-10:1992 and rated in accordance with BS EN ISO 717-1:1997, and evidence to this effect shall be published as part of the tender response.

3.0 Should laboratory acoustic performance information be unavailable or be unrepresentative for the configurations required, or pre-tender laboratory testing cannot be accommodated within tender submittal and evaluation timescale, the contractors submittal must be supported by third party calculation of sufficient detail to show attenuation contributions arising from framing and suchlike features at tender submittal stage. In this event, the successful tenderer shall be required to promptly undertake laboratory testing and rating to demonstrate conformance of particular test pieces, yet to be selected, with this specification and to make available such substantive evidence to an agreed timescale and at the tenderer's cost.

Appendix 4: Glossary of Terms

Term	Description	Explanation
	Noise	Unwanted sound. In the explanation given below the words 'sound' and 'noise' can often be used interchangeably, depending on context.
dB	The decibel scale	The decibel (or dB) scale is the scale on which sound pressure levels are commonly measured. It is a logarithmic scale and is used for convenience to compress the audible range of sound pressures into a manageable range, from 0 dB to 140 dB. The zero of the scale, 0 dB, corresponds to the threshold of hearing, 0.00002 Pa, and the upper limit, 140 dB, corresponds to 20 Pa, the threshold of pain.
	Sound pressure	Sound is a disturbance or fluctuation in air pressure, and sound pressure, measured in pascals (Pa), is used as a measure of the magnitude of the sound. The human ear can detect sound pressures in the range from 0.00002 Pa to 20 Pa. This is an enormously wide range and so for convenience sound pressures are commonly measured on a decibel (dB) scale.
Lp	Sound pressure level	Instantaneous value of Sound Pressure Level (Lp).
	Sound power	The sound energy radiated per unit time by a sound source, measured in watts (W)
L_w	Sound power level	Sound power measured on a decibel scale: $L_W = 10\log(W/W_0)$, where W_0 is the reference value of sound power, 10^{-12} W.
f	Frequency	The frequency of a musical note is what gives it its pitch. It is the number of cycles of the fluctuating sound pressure which occur each second, and is measured in cycles per second, or Hertz (Hz). The human ear can detect frequencies in the range 20 to 20 000 Hz. Most sounds and noises are a mixture of all frequencies, called broad-band noise.
	Octave bands Octave band spectra	In order investigate the frequency content of broad band sounds, called its frequency spectrum, measurements of sound pressure are carried out over a range of frequency bands. The most common method is to split the audio frequency range into 8 or 9 octave bands. An octave is a frequency range from one particular frequency to double that frequency.
	Free-field	A free field sound level measurement is one which is unaffected by the presence of any sound reflecting surfaces. In an outdoor situation this is usually taken to mean with no sound reflecting surfaces within 3 m. of the source.
	Facade correction Factor	The difference between the façade level and the free field level (in the absence of the façade) is called the façade correction factor.
A	A-weighting	One of the three frequency weightings (A, C and Z) used in sound level meters, and defined in BS EN ISO 61672-1; a very widely used method of producing a single figure measure of a broad band noise which takes into account, in an approximate way at least, the frequency response of the human hearing system. The idea is that sound levels measured in this way should give an indication of the loudness of the sound.
C	C-weighting	One of the three frequency weightings (A, C and Z) used in sound level meters, and defined in BS EN ISO 61672-1; it is much closer to the Z weighting than the A-weighting, and has been used, before the introduction of the Z weighting, as 'linear' or 'unweighted' sound level.
Z	Z-weighting	One of the frequency weightings defined in BS EN ISO 61672-1; 'Z' stands for zero and the Z weighting

		correspond to a 0 dB weighting at all frequencies. Previously known as 'linear'.
f	Time weighting, fast	An averaging time used in sound level meters, and defined in BS EN ISO 61672-1.
s	Time weighting, slow	An averaging time used in sound level meters, and defined in BS EN ISO 61672-1.
L_A (dBA)	A- weighted sound pressure level	The value of the sound pressure level, in decibels, measured using an A-weighting electronic circuit built into the sound level meter. The vast majority of noise measurements are carried out in this way.
$L_{Aeq,T}$	Equivalent continuous sound level	It represents a measure of the 'average' sound level over the measurement period. It corresponds to the steady level of sound which, over the same period of time, T, would contain the same amount of (A-weighted) sound energy as the time varying noise. Also known as the Average sound level. This is the most common method of measuring time varying noise, and within certain limits gives the best correlation with human response to noise, for example with annoyance.
$L_{Amax,T}$	Maximum sound pressure level	The instantaneous maximum sound pressure level, usually A-weighted, 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 LAeq,T value. The time weighting, F or S, must always be specified.
T	Reverberation time	The time required for the steady sound pressure level in an enclosed space to decay by 60 dB, measured from the start of the decay
T20, T30	Reverberation time	The reverberation measured using certain types of instruments over a 20 dB or 30 dB part of a reverberation time decay curve.
R_w	Weighted sound reduction index	A single figure overall value for the field sound insulation of a building element derived from the individual third octave band values of R' using a procedure defined in BS EN ISO 717-1:2013.
$D_{n,e,w}$	Weighted element normalised level difference	The single figure value derived from 16 values one-third octave band values of $D_{n,e}$ (between 100 Hz and 3150 Hz) using the method described in ISO 717-1.