NOISE ASSESSMENT REPORT FOR A RESIDENTIAL DEVELOPMENT AT:

56 DALE STREET MANCHESTER

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1.0 Introduction

Azymuth Acoustics is appointed by Facetspera Limited to provide an acoustic assessment of a site on Dale Street in the centre of Manchester. The proposed development involves conversion of an existing listed office building into residential apartments.

This report is intended to provide information relating to potential noise levels affecting the site as required by Manchester City Council in order to support the detailed planning application for the residential development. In particular the report sets out the following details:

- The results of a baseline noise survey undertaken at the proposed development site.
- The appropriate assessment criteria and guidance relating to noise in the environment as associated with this kind of development.
- An assessment of the appropriate level of protection against noise that should be provided as part of the development.

2.0 Baseline Noise Survey

2.1 Measurement Procedures

The instrumentation used for the environmental noise survey consisted of a SvanTek 959 Type 1 precision sound level meter (ser. # 12976, cal. #13699/2011) and a 01dB Cal 01 SL sound calibrator (ser. # 30112, cal. #13698/2011.) The sound level meter was set to record noise levels a number of times over a nominal sample time of 5 minutes. The equipment was calibrated before and after the noise measurements. Weather at the time of survey was clear with low wind speeds.

The noise measurements were undertaken on 4th and 9th December 2012 by Stratton Barrett, using the sound level meter at the following measurement locations on the site:

Measurement Location	Description
1	Corner of Dale Street and China Lane, steps of existing front entrance (façade level)
2	Mangle Street, side / rear elevation of proposed apartments
3	Dale street @3m from existing façade
4	Back Piccadilly, middle of street

Table 1: Summary of Noise Measurement Positions, Dale Street Manchester



Figure 1: Noise measurement positions marked in red on location plan

2.2 Summary of Measured Noise Levels

Full results of the noise levels recorded by Azymuth Acoustics during the course of the survey are included in Appendix B of this report.

The following table summarises the results of the noise measurements undertaken around the proposed site in terms of the average daytime (07:00 to 23:00 hours) and night-time (23:00 to 00:00 hours) statistical noise levels.

Position	Period	L_{Amax}	L_{Aeq}	L_{A10}	L_{A90}	NEC*
1	Daytime	96.8	69.2	66.6	51.7	C
1	Night-time	90.6	63.5	63.2	46.5	C
2	Daytime	70.5	56.6	59.3	52.6	B
2	Night-time	67.4	52.1	54.5	47.4	B
3	Daytime	96.5	68.5	70.4	56.5	C
3	Night-time	82.4	61.8	63.4	46.6	C
4	Daytime	77.6	55.6	57.0	53.0	B
4	Night-time	72.2	53.6	54.8	50.3	B

Table 2: Summary of Noise Survey Results (dBA)
Noise Exposure Category as relates PPG24 (now withdrawn, see below)

2.3 Description of the Noise Climate

During both day and night time periods, the principal source of noise in the vicinity of the site is vehicle traffic using Dale Street and surrounding routes including the side streets bordering the site. Traffic on these routes during survey periods generally included light commercial (vans) and cars.

Noise from pedestrians / passers-by also made a contribution to the noise climate during night time measurement periods. It should be noted that the measured noise levels at Locations 1 and 3 were affected by noise from traffic running over a loose manhole cover. Thus L_{Amax} values for locations on Dale Street are higher than would normally be expected near a road of this type.

3.0 Noise Assessment Criteria

In order to assess the extent of any measures which might be necessary in order to comply with suitable conditions relating to potential noise sources, Azymuth Acoustics has reviewed various guidance documents and standards, these include:

- PPG24 - Planning and Noise (now withdrawn)
- World Health Organisation Guidance
- British Standard 8233

3.1 Planning Policy Guidance Note PPG24 (now withdrawn)

PPG24 has now been withdrawn but is effectively the most appropriate guidance at present. The document sets out government guidance on the use of planning powers by local authorities in order to minimise the adverse effects of noise in the built environment.

In particular, PPG establishes Noise Exposure Categories that are applicable in the case of new residential developments affected by transport noise or by mixed noise sources in which industrial noise does not dominate.

The survey results indicate that the site could be deemed to fall within Noise Exposure Category C for all periods at locations near Dale Street.

3.2 World Health Organisation

In 1980 the World Health Organisation proposed environmental health criteria for community noise including consideration of noise levels at which sleep disturbance may take place. These guidelines were amended by the World Health Organisation in 1999. The guidance suggests that an internal L_{Aeq} below 30 dB is required to fully preserve the restorative process of sleep.

3.3 British Standard 8233

BS 8233 provides a code of practice for the sound insulation of a variety of building types affected by general environmental noise.

It provides recommendations for control of noise in and around buildings and suggests appropriate criteria / limits for a variety of different situations including residential properties.

The following table summarises the noise limits suggested by BS 8233 applying to residential properties.

Criterion	Room	Design Range $L_{Aeq,\ T}$ dB	
		Good	Reasonable
Reasonable resting / sleeping conditions	Living rooms	30	40
	Bedrooms at night[1]	30	35
[1] For a reasonable standard in bedrooms at night, individual noise events should not regularly exceed 45 dB L_{Amax}			

Table 3: Noise Limits for Residential Properties Suggested in BS 8233

3.4 Summary of Noise Assessment Criteria

Based on the guidance outlined above, Azymuth Acoustics has carried out a noise assessment with the primary aim of providing satisfactory conditions inside the apartments themselves. The criteria adopted are:

- Daytime noise levels not to exceed 40dB $L_{Aeq,\ 16\ hr}$ in living rooms
- Night-time noise levels in bedrooms not to exceed 30dB $L_{Aeq,\ 8\ hr}$ (in addition, internal noise levels should not regularly exceed 45dB L_{Amax} inside bedrooms.)

It is important to note that BS 8233 / WHO guidance would deem the noise levels detailed above to apply with windows closed but with passive ventilation systems open (e.g. trickle vents).

4.0 Assessment of Noise Levels

4.1 Assessment of Noise Levels

Noise levels along the Dale Street elevation are in the range 66 – 69dB $L_{Aeq,5\ min}$ for daytime periods and 56 – 61 dB $L_{Aeq,5\ min}$ for early night time periods (taking into account the noisy manhole cover experienced during the noise survey). As such, this part of the site would be within Noise Exposure Category C at night.

Daytime free-field noise levels at locations along Mangle Street (side elevation of proposed apartments) typically fall within the range 55 - 57dBA, with night time levels between 51 - 54dB $L_{Aeq,5\ min}$. As such, this part of the site would be within Noise Exposure Category B at night.

The measured noise levels suggest that noise mitigation measures will be required to provide suitable acoustic conditions inside the residential apartments.

On the basis of the measured noise levels it is estimated that an overall noise reduction of approx. 25-30dB will be required in order to achieve satisfactory conditions inside residences.

5.0 Recommendations for Noise Mitigation

This section sets out the recommended minimum noise mitigation measures which need to be employed in order to satisfy the requirements of the noise assessment criteria and ensure satisfactory noise conditions inside the apartments.

5.1 Glazing Specifications

The recommended specification for the glazing to apartments is summarised in Table 4 below.

Location	Glazing Specifications (overall to include frame)	Proposed Glazing Types
All bedrooms and living rooms, Dale Street elevation	Airborne sound insulation R_W 35dB or better	Original sash windows refurbished to provide a good seal, glass replaced with Slimlite 4/4/6.8mm Optiphon units (quoted R_w35dB)
All bedrooms and living rooms, Mangle Street elevation	Airborne sound insulation R_W 32dB or better	Original sash windows refurbished to provide a good seal, glass replaced with Slimlite 4/4/6.8mm Optiphon units (quoted R_w35dB)
All other locations including rooms into courtyard light well and roof windows	Airborne sound insulation R_W 30dB or better	Original sash windows refurbished to provide a good seal, glass replaced with Slimlite 4/4/4mm units

Table 4: Recommended glazing specifications for the apartment development, 56 Dale Street

Original sash windows should be made good to ensure gaps / holes are sealed as tightly as possible.

Subject to achieving an airtight seal to frames, the specification outlined above would result in satisfactory noise levels inside the accommodation as set out in Section 3.4 of this report.

A review of refurbishment details for the sash units will be provided in a separate document if required.

5.2 Other Elements of the Building Envelope

Other elements of the building envelope should have the following minimum sound insulation performance:

- External Walls: minimum sound insulation R_W 50dB. This minimum is likely to be significantly exceeded by the existing masonry building structure.
- Roof: minimum sound insulation R_W 45dB. This minimum is likely to be exceeded by the existing building structure with the addition of thermal insulation and internal ceilings.

5.3 Ventilation

Inhabitants of bedrooms and living rooms with windows on the Dale Street elevation should not rely solely on opening windows for enhanced background ventilation.

It is understood that a mechanical air extract system is proposed within each apartment, which would act to purge warm air in periods of warm weather. The proposed ventilation strategy assumes a degree of air leakage through refurbished sash windows to provide fresh air input.

It is understood that trickle ventilation is not proposed to any windows as part of the initial refurbishment works. On completion, should air permeability be insufficient then trickle ventilation will be retrofitted.

Where trickle ventilation is required to rooms on the Dale Street façade this should be acoustically rated to achieve min. $D_{n,e,w}$ 42dBA.

6.0 Conclusions

Azymuth Acoustics has undertaken an environmental noise assessment of the proposed apartment development at 56 Dale Street in Manchester city centre.

Noise levels Dale Street are typically 66 - 69dB $L_{Aeq,5\ min}$ during the daytime and between 56- 61dB $L_{Aeq,5\ min}$ during night-time periods 23:00 – 00:00. The measured noise levels place the site in Noise Exposure Category C as defined in PPG24. As such it would be recommended that the development be protected by noise mitigation measures including:

- R_w35dB glazing to all bedrooms and living rooms on the Dale Street elevation (see Table 4 above)
- Existing sash windows should be refurbished to achieve a good acoustic seal throughout
- Provision of a suitable ventilation strategy to preclude the need to open windows for ventilation in periods of warm weather in rooms on the Dale Street elevation.
- Adequate sound insulation for the façade and roofing elements of the building

Appendix A

Glossary of Acoustic Terms

Decibel (dB)
This is the unit used to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro Pascal to 100 Pascal.)

dB(A)
This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. A-weighting) to compensate for the sensitivity of the human ear to sound of different frequencies. The A-weighting curve is implemented in sound level meters using an electronic filter that approximately corresponds to the frequency response of the ear.

Octave Band Noise Level
The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz. The ear is also generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum can be divided into frequency bands. The most commonly used frequency bands are octave bands, in which the mid-frequency of each band is twice that of the band below it.

L_{Aeq}
This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over a given time period.

Sound Reduction Index (SRI)
Difference measured between the amount of energy flowing towards the wall in the source room and the total amount of energy flowing towards the wall in the source room and the total amount of energy entering the receiving room (usual range 100 - 3150 Hz for one third octave band values). The SRI varies with frequency and is measured in a laboratory in either octave or one-third octave bands.

$SRI = L1 - L2 + 10 \log (S/A)$

Where: L1 = Noise level in the source room
L2 = Noise levels in the receiving room
S = Surface area of test specimen
A = Equivalent acoustic absorption area in the receiving room

Weighted Sound Reduction Index (R_w)
This is a weighted single figure descriptor of the sound insulation performance of a partition measured under laboratory conditions. The procedure used to quantify the R_w is to compare the sound reduction index (SRI) in each of the one-third octave bands from 100Hz to 3150Hz against a set of standard reference curves.

Vibration Dose Value (VDV)
VDV is defined in BS6472: 1992 and is calculated by taking the fourth root of the integral (with respect to time) of the fourth power of acceleration after it has been frequency-weighted, ie VDV takes account of both the spectral and the time domain characteristics of the vibration. The frequency-weighted acceleration is measured in m/s^2 and the time period over which the VDV is measured is in seconds. This yields VDVs in $m/s^{1.75}$.

Appendix B

Full Results of Noise Survey