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Acoustic Assessment Report

9th November 2017 Peter Clark

1. INTRODUCTION

1.1 A noise survey has been carried out at the commercial/office property 4 Bloomsbury Place, London, WC1. The property is to be extensively refurbished and a part of the proposed work includes the installation of air conditioning systems which will serve a number of the rooms at the property. The noise survey and assessment report is required to accompany a Planning Application for the installation of the external air conditioning units at the property. A total of FIVE external units are proposed such that three outdoor units are to be located in the rear courtyard at ground floor level with a further two smaller units located at roof level. For aesthetic and acoustics reasons, the rear courtyard units are to be located internal to an acoustic louvre screen/enclosure. 4 Bloomsbury Place lies close to the corner of Southampton Row and Bloomsbury Place itself and is a single property over five floors with a small extension at the rear. The majority of neighbouring properties are also commercial/office spaces although there is some residential properties nearby, the nearest is lower ground floor level of 3 Bloomsbury Place and the top floor also in 3 Bloomsbury Place. The rear courtyard of 4 Bloomsbury Place is shielded from neighbouring properties by high brickwork walls. At roof level, the proposed location of the units is such that it is shielded from neighbouring properties/areas of interest by roof-top parapet walls, chimney breasts and the roof access stairway. The nearest neighbouring areas for assessment

purposes are (a) the neighbouring rear courtyard/garden of 5 Bloomsbury Place for the courtyard unit and (b) the roof-light in 3 Bloomsbury Place[1] with respect to the roof-mounted units.

1.2 The measurements have shown that the proposed installation meets with the requirements of the London Borough of Camden (LBC) Environmental Noise Policy and without the need for additional noise attenuation measures.

1.3 The site location and surroundings are given in Figure 1 below:

Figure 1: Site Location (© Google Maps) – 4 Bloomsbury Place (from rear)

[1] There is a single roof window in 5 Bloomsbury Place however this has not been considered in the assessment as the window serves an unoccupied attic storage area.

2.0 NOISE MEASUREMENTS

2.1 Environmental noise measurements were carried out from Thursday 26th October to Tuesday 31st October 2017. Sound level measurement equipment was installed in two locations at the property; (a) in the courtyard/garden at the rear of the property and (b) on the roof-top. In both cases the monitor was located close to the neighbouring properties and used to log noise levels over the five day period. The measurement equipment is listed below in Table 1.

Table 1 Environmental Noise Measurement Instrumentation

No.	Description
1.	Larson Davis Model 812 Sound Level Meter.
2.	Larson Davis Model 2541 1/2" Diameter Condenser Microphone.
3.	Larson Davis Model CAL200 Sound Level Meter Calibrator.

2.2 All acoustic equipment conforms to the relevant parts of BS EN 60651:1994 (equivalent to BS 5969:1981) for the requirements of Type 1 acoustic accuracy. Additionally, the relevant equipment conforms to the specifications contained within BS EN 60804:1994 (equivalent to BS 6698:1976) for integrating sound level meters.

2.3 In order to verify the correct operation of the equipment on site, an acoustic calibrator was applied during the course of the measurements. A

maximum change of 0.1 dB(A) was noted, this can be considered as an insignificant change. The calibrator complies with the specifications of IEC 942:2003. The equipment was previously laboratory calibrated in January 2017.

2.4 Fast meter response was used for all measurements carried out during the course of the survey.

2.5 Noise levels are expressed in terms of continuous equivalent noise levels (L_{Aeq}) over an appropriate time period. The use of L_{Aeq} allows non-steady and non-continuous noise to be assessed and compared to the existing noise climate. L_{Aeq} is referred to as the ambient noise level. In addition to this background noise levels have also been measured and are expressed as L_{A90}. A full explanation of terminology commonly used in the measurement and assessment of noise levels is given in Appendix B at the end of this report.

3.0 RESULTS

3.1 Noise level measurements were carried out at 5 minute intervals during the survey period. Ambient (L_{Aeq}) and background (L_{A90}) noise levels were measured. Minimum noise levels for the day-time (07:00 to 19:00 hrs), evening time period (19:00 to 23:00 hrs) and night time period (23:00 to 07:00 hrs) have been determined. Results for each measurement location are summarised in Tables 2.1 and 2.2 below:

Table 2.1: Summary Results (Rear Courtyard/Garden)

	Day	Evening	Night
L_{A90}	56.6	55.7	54.3(40.5)*
L_{Aeq}	62.0	61.7	59.7

*Note: The lowest night time background noise level measured during the survey period was 40.5 dB(A) and occurred at 4.00am on Monday 30th October 2017.

Table 2.2: Summary Results (Roof)

	Day	Evening	Night
L_{A90}	58.5	57.3	55.6(46.0)*
L_{Aeq}	63.0	62.3	60.2

*Note: The lowest night time background noise level measured during the survey period was 46.0 dB(A) and occurred at 4.00am on Monday 30th October 2017.

3.2 Although the survey was not attended on a full time basis, it was noted that during site visits that noise from traffic using Southampton Row was dominant. The rear courtyard/garden of the property is relatively well-sheltered although noise from traffic on Southampton Row could still be heard. A full listing of measured noise data for the period is given in the graphs at the end of this report (Figure A1a and A1b) for each measurement location. Photographs showing the noise monitors in position at the property are shown in Figure A2a and A2b.

3.3 Noise level data for the units[2] to be installed at the property are given as follows: 2x Daikin RXYSQ8TY1 unit S.P.L. 55 dB(A) at 1m each and 1x Daikin 3MXS52E unit S.P.L. 47 dB(A) at 1m to be located in the rear courtyard at ground floor level and 2x Daikin RXYSCQ5TV1 units S.P.L.

[2] All noise level data are given as Sound Pressure Level measured 1m from the respective unit in either heating or cooling mode under anechoic conditions.

52 dB(A) at 1m each to be located at roof level (See attached data sheets shown in Figures A3). The nearest neighbouring window/area of interest for the rear courtyard unit to be assessed is the rear courtyard/garden of the neighbouring property (5 Bloomsbury Place). The roof-light in 3 Bloomsbury Place is the nearest window considered in the assessment for the roof-top units. Respective layouts are shown in Figures A4a and b. Calculated noise levels are as follows:

Rear Courtyard Unit (with respect to the rear garden of 5 Bloomsbury Place)

- Total Unit S.P.L at 1m: 58 dB(A)[3]
- Attenuation from acoustic louvred screen: - 9 dB(A)[4]
- Barrier Attenuation from garden wall: -15 dB(A)[5]
- Distance correction (2m): - 6.0 dB(A)[6]
- Resultant predicted noise level: 28.0 dB(A)

Roof-top Units (with respect to roof-light in 3 Bloomsbury Place)

- Unit S.P.L. at 1m: 52 dB(A)
- 2 off units: + 3dB(A)
- Partial barrier/screening from parapet walls/chimney breast and access stairway walls: -5 dB(A)
- Distance correction (3m): - 9.5 dB(A)
- Resultant predicted noise level: 40.5 dB(A)

[3] Total S.P.L. calculated from 2x units at 55 dB(A) and 1x unit at 47 dB(A)
[4] See Figure A5 at the end of this report for technical details of typical acoustic louvre
[5] Path length difference is calculated to be 1m
[6] 3m from location of proposed unit to 1m within neighbouring garden

3.4 The London Borough of Camden Replacement Unitary Development Plan – Appendix 1; Table E "Noise levels from plant and machinery at which planning permission will not be granted" is listed below.

Noise description and location of measurement	Period	Time	Noise Level
Noise at 1 metre external to noise sensitive façade	Day, evening & night	0000-2400	5dB(A)<L_{A90}
Noise that has a distinguishable discrete continuous note	Day, evening & night	0000-2400	10dB(A)<L_{A90}
Noise that has distinct impulses	Day, evening & night	0000-2400	10dB(A)<L_{A90}
Noise at 1 metre external to sensitive façade where L_{A90}>60dB	Day, evening & night	0000-2400	55dB L_{Aeq}

3.5 The proposed air conditioning equipment does not attract the + 5 dB(A) correction referred to in *" paragraph 8 of BS4142"* (i.e. contains no distinguishable discrete continuous note or distinct impulses)

3.6 It therefore follows that the criterion to meet is 35.5 dB(A) for areas/windows at lower level and 41.0 dB(A) for areas/windows at roof level (these noise levels being 5 dBA less than the lowest night-time background noise level measured in respective locations– see Tables 2.1 and 2.2 above). The proposed installation is shown to meet with the criterion without the need for further noise control.

4.0 CONCLUSION

4.1 A noise measurement survey and assessment has been carried out on the external air conditioning condensing units which are to be installed at 4 Bloomsbury Place, London WC1. A total of five units are proposed, three are to be located in the rear courtyard/garden with a further two smaller units located on the roof. For aesthetic and acoustic reasons, the units in the rear courtyard are to be located internal to an acoustic enclosure/screen.

4.2 The proposed installation has been shown to meet with the London Borough of Camden's acoustic criteria. No further noise control measures are required.

APPENDIX A: GRAPHS AND FIGURES.

Figure A1a: Environmental Noise Data – 26th to 31st October 2017.

Rear Courtyard/Garden

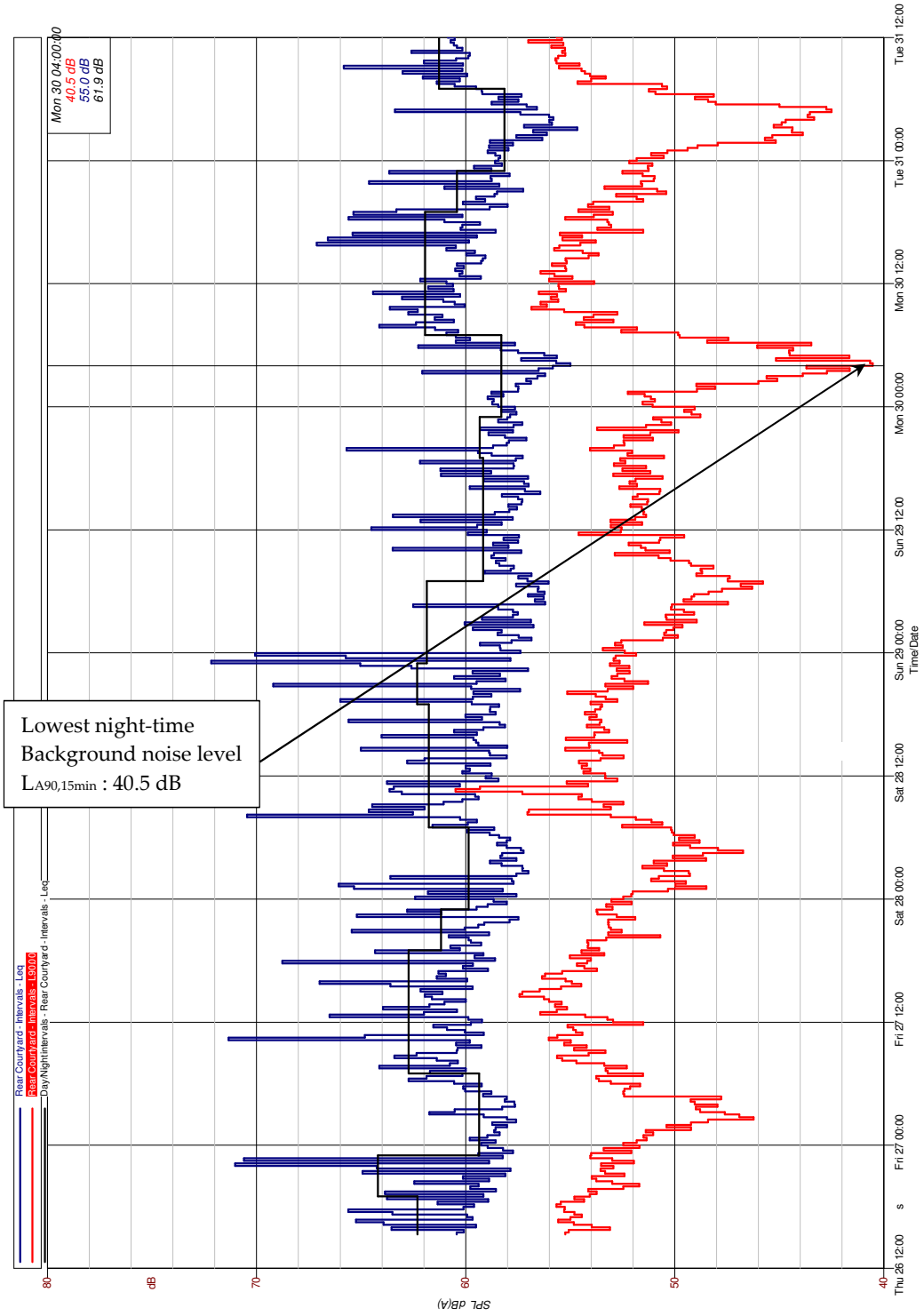


Figure A1b: Environmental Noise Data – 26th to 31st October 2017.

Roof-top

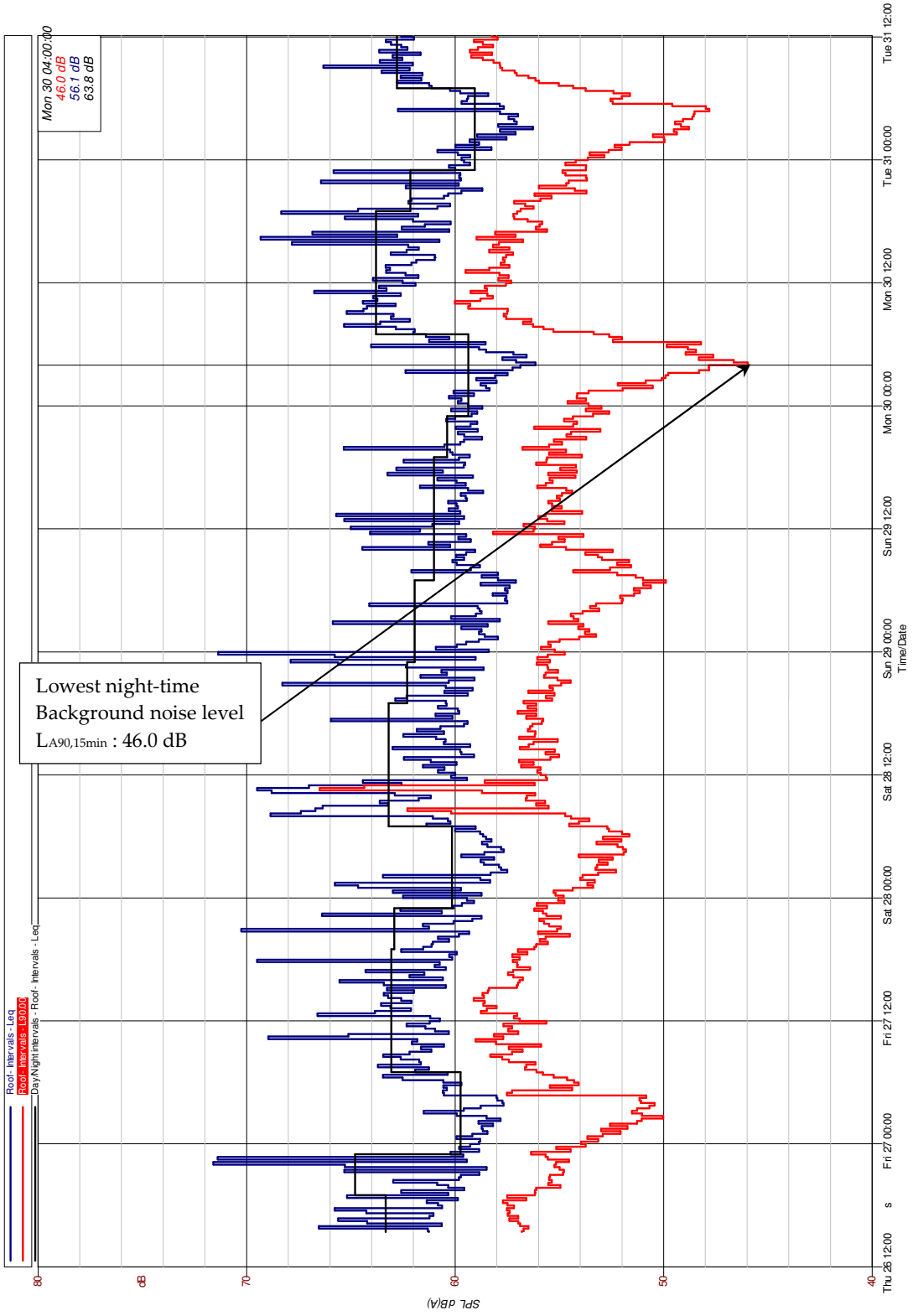


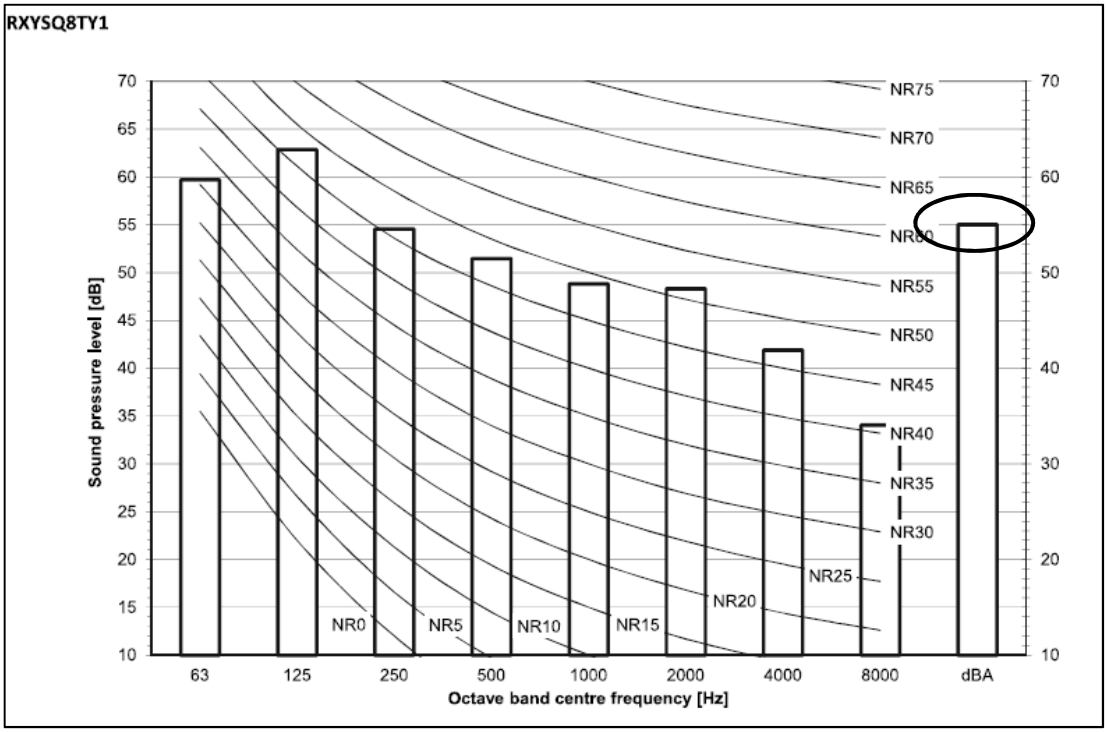
Figure A2a: Noise Monitoring Equipment in rear courtyard/garden of 4 Bloomsbury Place

Figure A2b: Noise Monitoring Equipment on roof 4 Bloomsbury Place

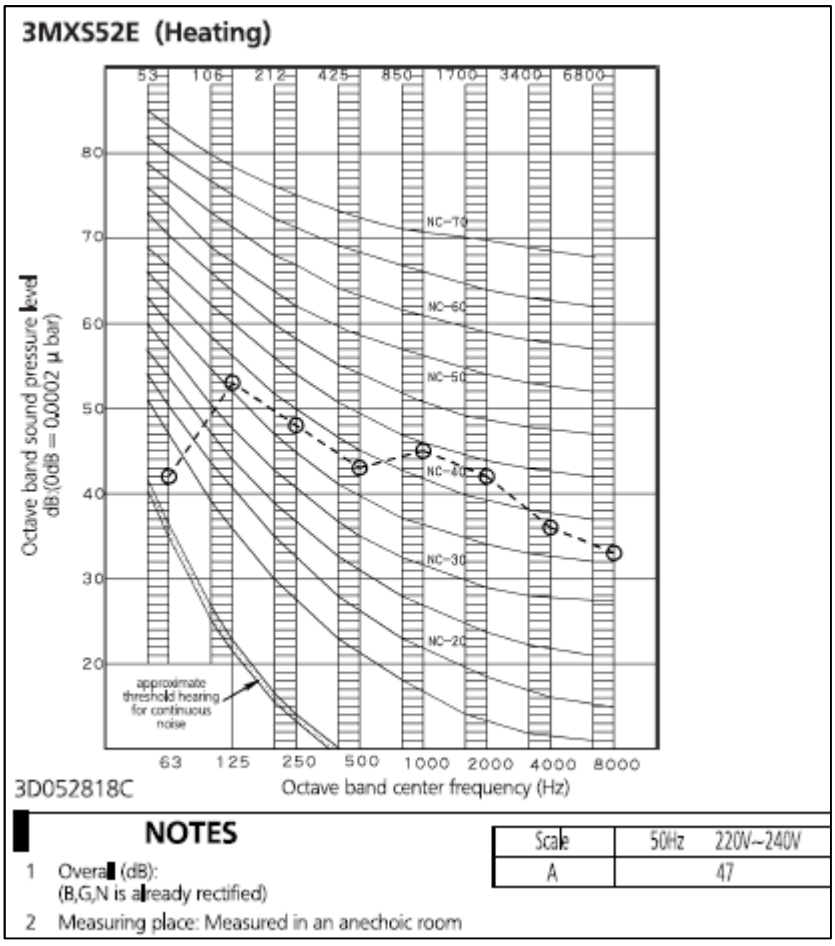
Figure A3: Equipment Noise Data

Rear Courtyard Unit

Daikin RXYSQ8TY1



Daikin 3MXS52E



Roof-top units:

Daikin RXYSCQ5 External Condenser Unit

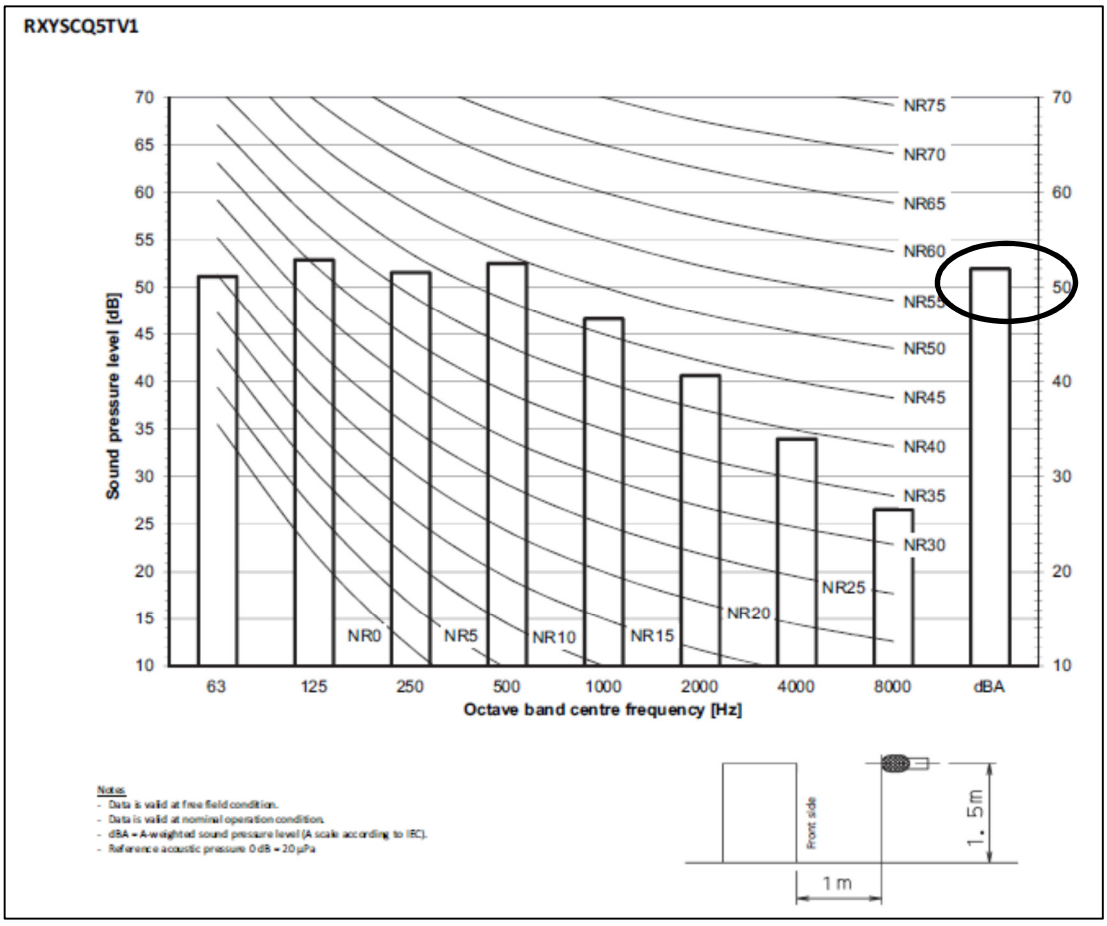
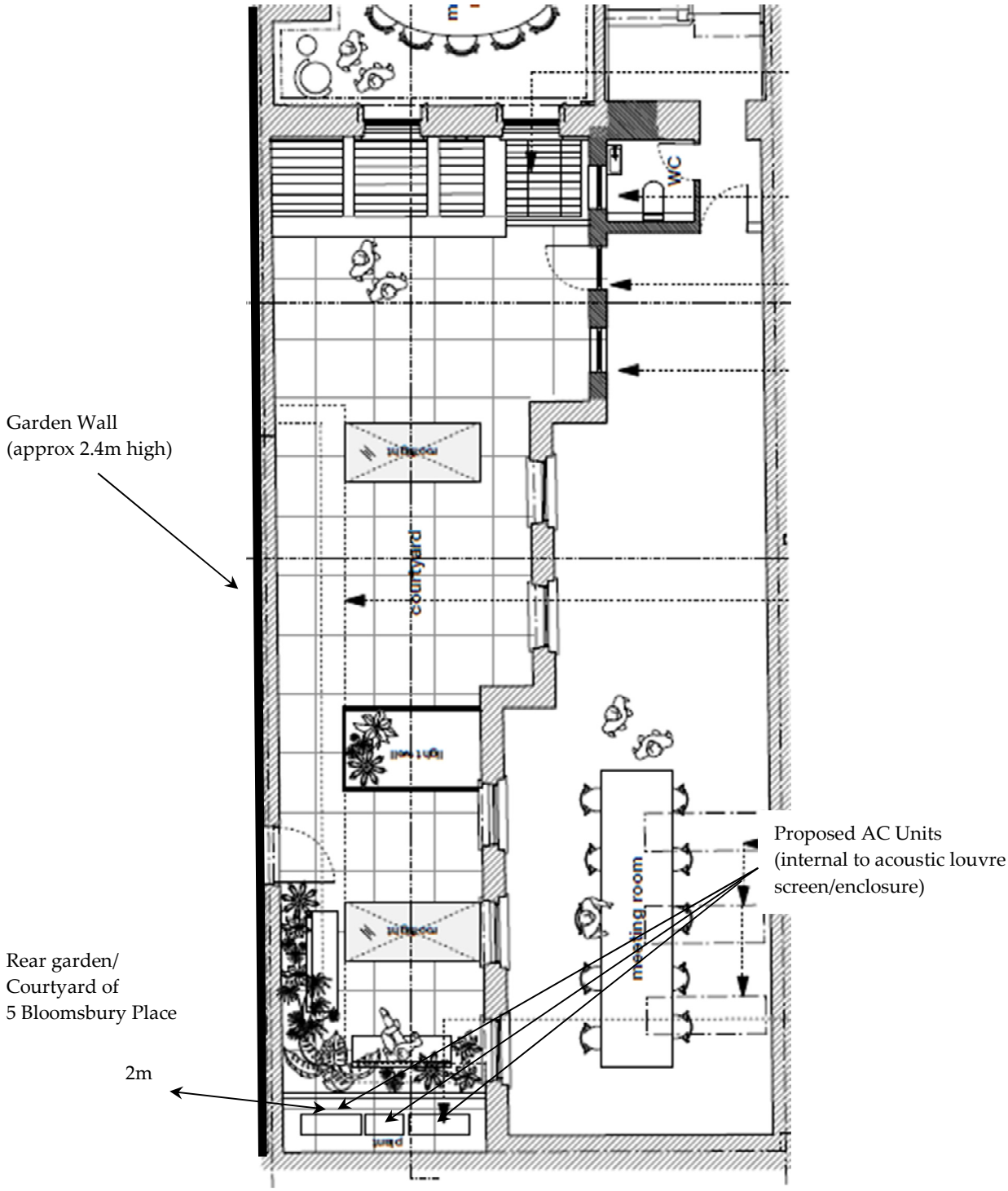
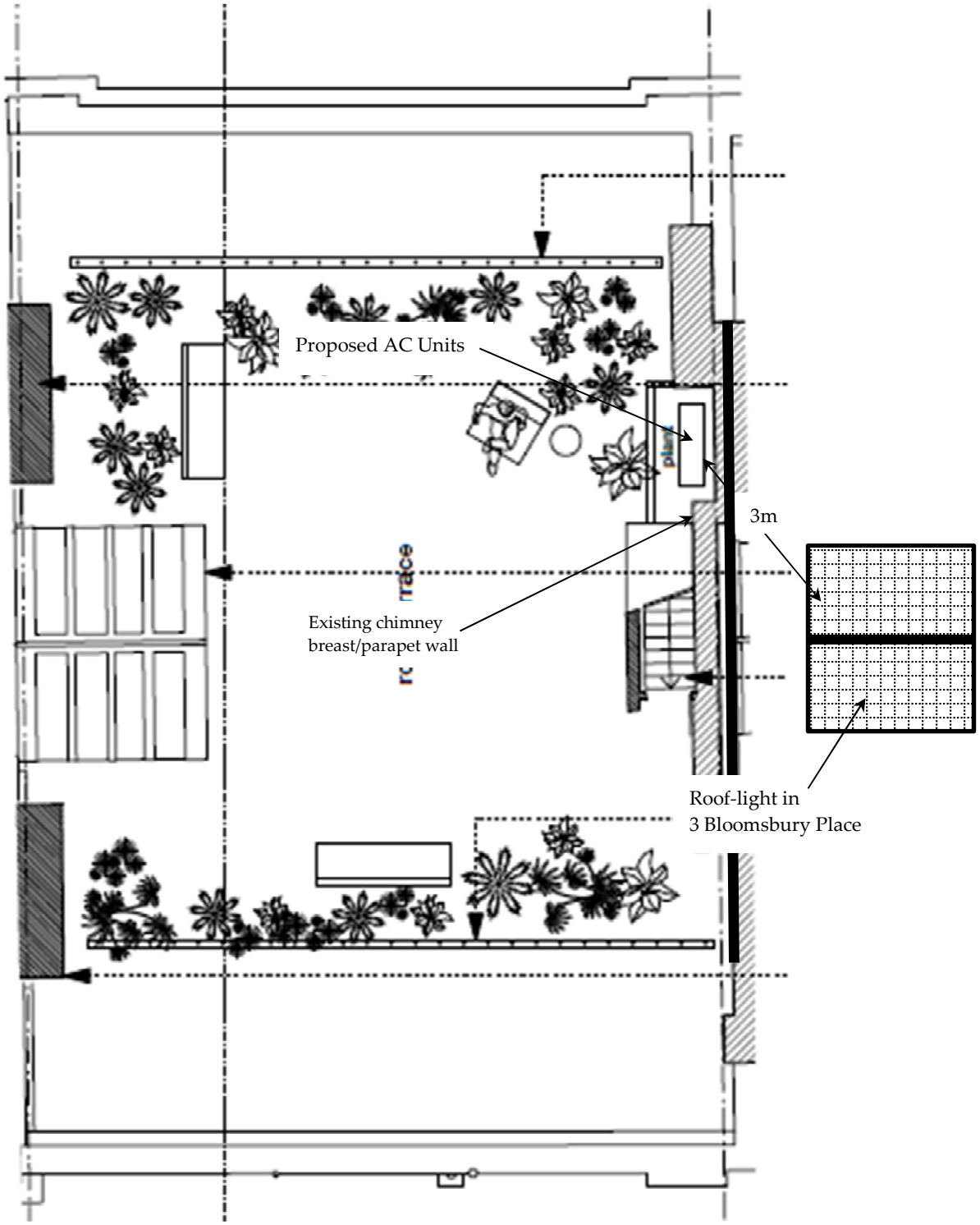


Figure A4a: Layout Drawing (Ground Floor)



Extract from Johanna Molineus Architects Drawing 257.04.101 Revision D

Figure A4b: Layout Drawing (Roof)



Extract from Johanna Molineus Architects Drawing 257.04.105 Revision C

Figure A.5: Acoustic Louvres Specification (Typical)

EEC Acoustic Louvres

APPEARANCE

EEC Acoustic Louvres can be manufactured to accommodate the various dimensional and appearance requirements a building project may demand.

The louvres can be designed and constructed to be installed in the exterior fabric of buildings or as complete acoustic enclosures to house noise emitting plant. Also supplied are acoustic louvred fully openable single and double doors.

Special materials and finishes available include stainless steel, anodised aluminium and painted to the complete BS colour range.

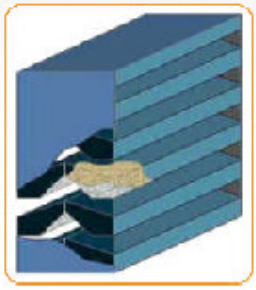
Louvres are supplied, in single bank modules (LA1) or back-to-back "chevron" modules (LA2) ranging from 150mm to 600mm deep.

CONSTRUCTION

Built to the highest quality and specification, all EEC acoustic weather louvres will have outer casings of not less than 1.2mm galvanised mild steel sheet.

The louvre blades and outer faces of the top and bottom support sections will not be less than 0.7mm galvanised mild steel sheet. The inner absorptive faces will not be less than 0.7mm galvanised perforated mild steel sheet.

The acoustic infill will be in-organic, non-hydroscopic, flame, moisture and vermin proof mineral wool with a minimum density of 48Kg/m 3 and packed under compression to prevent voids due to settlement.



PERFORMANCE

The overall acoustic performance for single and double bank acoustic louvres varies depending on the free area, louvre blade design and the noise spectrum from the attenuated plant item.

Typical SRI figures for standard Acoustic Louvre configurations are presented below

Frequency - Hz	63	125	250	500	1K	2K	4K	8K
LA1 SRI - dB	6	7	10	13	17	19	13	11
LA2 SRI - dB	9	10	14	20	30	33	32	30

AERODYNAMICS

It is generally recommended to avoid excessive regenerative noise from the louvres that air flow pressure losses across the louvres be kept below 20 Pa. This again varies on the final specification of each louvres, however no acoustic louvre should be run faster than 2.5 m/s.

quietly moving forward

NOISE AND VIBRATION CONTROL SPECIALISTS

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APPENDIX B: GLOSSARY OF NOISE TERMS AND UNITS.

1.0 Noise

1.1 The sounds that we hear are as a result of successive air pressure changes. These air pressure changes are generated by vibrating sources, such as train engines or wheels, and they travel to a receiver, i.e. the human ear, as air pressure waves.

1.2. The human ear is capable of detecting a vast range of air pressures, from the lowest sound intensity that the normal ear can detect (about 10^{-12} watts/m^2) to the highest that can be withstood without physical pain (about 10 watts/m^2). If we were to use a linear scale to represent this range of human sensitivity it would encompass more than a billion units. Clearly this would be an unmanageable scale yielding unwieldy numbers.

1.3. The scale can be compressed by converting it to a logarithmic or Bel scale, the number of Bels being the logarithm to the base 10 of one value to another (as applied by Alexander Graham Bell to measure the intensity of electric currents). The Bel scale gives a compressed range of 0 to 12 units which in practice is a little too compressed. A more practical operating range of 0 to 120 is obtained by multiplying by 10, ie. 10 x Bel, which produces the scale units known as decibels or dB.

1.4. Examples of typical sound intensity levels within the decibel range of 0 to 120 dB are listed below:

Commercial four-engine jet aircraft at 100m	120dB
Riveting of steel plate at 10m	105dB
Pneumatic drill at 10m	90dB
Circular wood saw at 10m	80dB
Heavy road traffic at 10m	75dB

Male speech, average, at 10m	50dB
Whisper at 10m	25dB
Threshold of hearing, 1000Hz	0dB

1.5. Due to this logarithmic scale noise levels have to be combined logarithmically rather than arithmetically. For example, two equal sound sources of 70 dB each, when operated simultaneously, do not produce a combined level of 140 dB but instead result in a level of 73 dB, ie. A rise of 3dB for each doubling of sound intensity. Subjectively, a 3dB change does not represent a doubling or halving of loudness; to make a sound appear twice as loud requires an increase in sound pressure level of about 10dB.

1.6. The subjective loudness of noise can be measured by applying a filter or weighting which equates to the frequency response of the human ear. This is referred to as an A-weighting and when applied results in noise levels expressed as dB(A).

1.7. dB(A) noise levels can be measured using a variety of noise indices. The index which correlates best with human response due to machinery noise is the L_{Aeq} this is the A-weighted L_{eq} which is referred to as the 'equivalent continuous noise level' and is a measure of the total sound energy generated by a fluctuating sound signal within a given time period.