38 MILLFIELD LANE, LONDON N6

PLANT NOISE ASSESSMENT

Report to

Mr Robert Jackman
38 Millfield Lane
Highgate
London
N6 6JB
A9146/R01-AEH

04/08/2009

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1.0 INTRODUCTION

Bickerdike Allen Partners (BAP) have been retained to undertake a plant noise assessment of a condenser unit for Robert Jackman at 38 Millfield Lane, London, N6 6JB. This is to advise on plant noise limits to comply with the requirements of London Borough of Camden (LBC).

A glossary of acoustical terminology is included in Appendix A.

2.0 CAMDEN COUNCIL CRITERIA

The client received a letter from the LBC development control planning services requesting that an acoustic report be carried out in accordance with the LBC standards. The LBC Unitary Development Plan gives guidance which states that "the council will only grant planning permission for plant or machinery, including ventilation or air handling equipment, if it can be operated without causing a loss to the local amenity and does not exceed the thresholds set out in the following table"

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 meter external to a sensitive façade	Day, evening and night	00:00 – 24:00	5 dB(A) < L_{A90}
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade	Day, evening and night	00:00 – 24:00	10 dB(A) < L_{A90}
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade	Day, evening and night	00:00 – 24:00	10 dB(A) < L_{A90}
Noise at 1 metre external to sensitive façade where L_{A90} > 60 dB	Day, evening and night	00:00 – 24:00	55 dB L_{Aeq}

Table 1 – London Borough of Camden plant noise criteria

Therefore the total noise from the plant should be 5 dB below the lowest background noise level during the day and night-time periods. If the noise generated by the plant has any tonal and/or intermittent qualities then the total noise from the plant should be 10 dB below the lowest background noise level during the day and night-time periods. If the background noise level is greater than 60 dB(A), the total noise from the plant should not exceed 55 dB L_{Aeq}.

The LBC guidance provides no specific guidance of the measurement period for the background noise level L_{A90}. The guidance in BS4142 which requires that the measurement time interval is sufficient to obtain a representative value of background noise level. The worked examples within the British Standard use a variety of time periods. BAP have adopted a time period of fifteen minutes as in our experience this provides a representative value.

The background noise level will vary throughout the day and night. BAP have carried out a 'worse case analysis' based on the lowest measured background noise level.

3.0 PROPOSED PLANT

The condenser unit is proposed to be a Daikin RZQ100DV1. The datasheet shows that this unit has a free-field noise level of 50 dB $L_{Aeq,T}$ at 1.5 m. The condenser unit is to be situated against a wall at the rear of the building at 38 Millfield Lane.

The manufacturer's noise data provides no indication that the units have any tonal qualities. This analysis therefore assumes none are present.

4.0 SITE PLAN

Figure 1 indicates the plan layout of the site and the proposed location of the condenser unit and the nearest noise sensitive window (NNSW). The NNSW is in a flat to the rear of the Westfield Apartments, which is approximately 15 m from the proposed location of the condenser units.

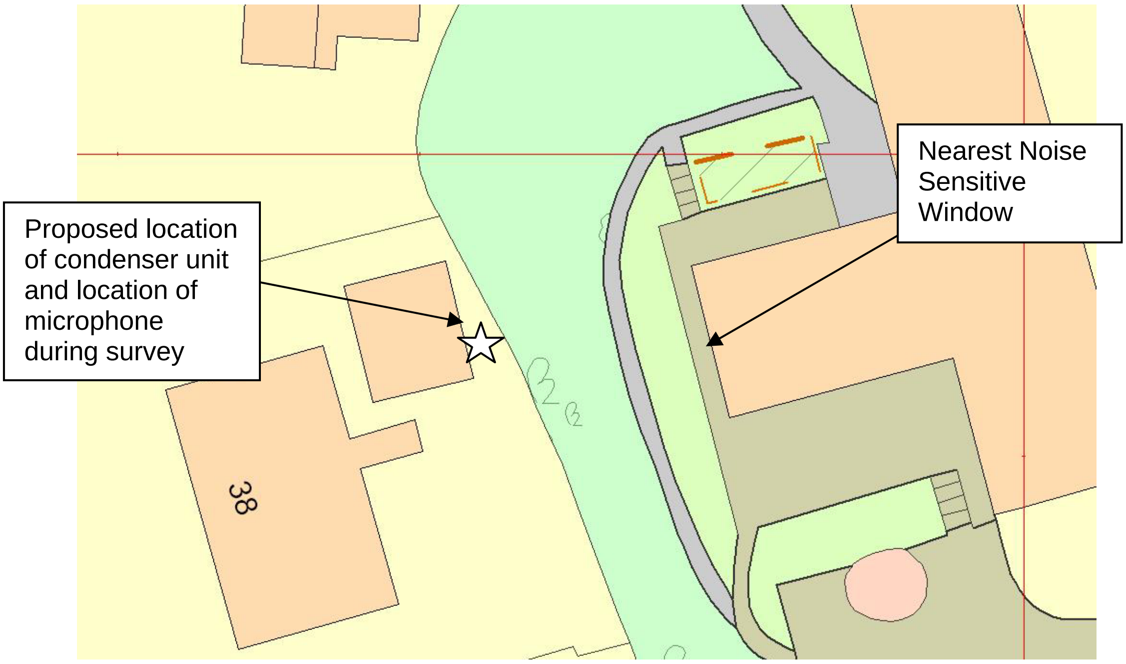


Figure 1 - Site plan showing location of plant and NNSW

5.0 SURVEY DETAILS

5.1 Methodology

An unattended, continuous background noise survey was undertaken from 10:15 on Thursday 9th July 2009 through to 10:15 on Friday 10th July 2009.

The microphone was situated on a pole approximately 3 m from ground level and at a façade location, see Figure 1. Whilst on site, there was occasional noise from traffic along Millfield Lane. There are no other plant items audible in the surrounding area.

The logger was set to take consecutive measurements of 15 minute duration.

5.2 Meteorological Conditions

The weather was clear and dry throughout the measurement survey. The prevailing wind speed was estimated to be well below 5 m/s throughout the survey.

5.3 Equipment

The equipment used consisted of a Norsonic type 118 sound level meter with a Norsonics calibrator. The equipment was calibrated both prior to and after the survey and no significant drift was observed.

6.0 RESULTS

6.1 Background and ambient noise survey

Detailed results from the measurement survey can be found in Appendix B.

The following table presents the average ambient noise level ($L_{Aeq,T}$) and the minimum background noise level ($L_{A90,15mins}$) measured during the daytime and night-time periods.

	Time (h:m)	Result dB(A)
Ambient noise level measured during the daytime period ($L_{Aeq,16hr}$)	07:00 - 23:00	58
Minimum background noise level measured during the daytime period ($L_{A90,15min}$)	Thursday 7th July 2009 at 22:00	36
Ambient noise level measured during the night-time period ($L_{Aeq,8hr}$)	23:00 – 07:00	42
Minimum background noise level measured during the night-time period ($L_{A90,15min}$)	Friday 10th July 2009 at 02:00	32

Table 2- Results of background and ambient noise survey

The noise emission limit for the plant is therefore **31 dB $L_{Aeq,15min}$** at the nearest noise sensitive window during the daytime and **27 dB $L_{Aeq,15min}$** at night at the window of the nearest residence.

7.0 PLANT NOISE ASSESSMENT

Using the manufacturer's noise data for the plant items, the resultant L_{Aeq} noise level at the NNSW can be calculated for the situation when the units are running on maximum capacity, this is shown in Table 3.

	dB(A)
Sound pressure level of unit at 1.5 m	50
Sound pressure level of unit at 15 m, -20xlog10(1.5/15)	30
Source Directivity	+3
Façade correction	+3
Plant noise at NNSW	**36**

Table 3 – Calculation of total plant noise at NNSW

The sound pressure level at the NNSW is calculated as 36 dB(A) L_{Aeq} (façade). This total plant noise level has been used to undertake a plant noise assessment against the LBC for the daytime and night-time criteria, as set out in Table 4 and 5.

	dB(A)
Maximum plant noise at nearest noise sensitive window	36
Maximum permissible plant noise at NNSW	31
Excess	**+5**

Table 4 – Daytime plant noise assessment

	dB(A)
Maximum plant noise at nearest noise sensitive window	36
Maximum permissible plant noise at NNSW	27
Excess	**+9**

Table 5 – Night-time plant noise assessment

These assessments show that at the NNSW the total plant noise exceeds the maximum permissible plant noise level required to meet the LBC criteria during the daytime and night-time.

As the plant noise level exceeds the LBC criteria, further noise mitigation measures are required.

8.0 REMEDIAL MEASURES

Remedial measures are required to reduce the noise from the condenser unit by a total of 9 dB. A enclosure constructed of staggered timber board and 1.8 m high is proposed which will reduce noise by approximately 10 dB. Details of the proposed enclosure are given in Appendix C.

9.0 CONCLUSION

Bickerdike Allen Partners have undertaken a plant noise assessment for Robert Jackman at 38 Millfield Lane, London, N6 6JB to accompany a planning application for a condenser unit.

Using background noise levels obtained from an unattended background noise survey, calculations have been completed to determine the maximum limit sound power level permitted of the condenser unit.

An assessment using noise levels of the selected plant item shows that further noise mitigation measure will be required to meet the criteria set by the London Borough of Camden. A close boarded timber fence has been proposed as a suitable remedial measure and details of this fence has been provided.

Predictions indicate that the proposed plant will comply with local authority standards with these proposed mitigation measures.

Alice Hubley
Acoustic Consultant

John Miller
Partner

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

The Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2 x 10^{-5} pascals) and the threshold of pain is around 120 dB.

The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, L_w is expressed in decibels, referenced to 10^{-12} watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

Noise Rating

The Noise Rating (NR) system is a set of octave band sound pressure level curves used for specifying limiting values for building services noise. The Noise Criteria (NC) and Preferred Noise Criteria (PNC) systems are similar.

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

Environmental Noise Descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow.

$L_{Aeq, T}$ The most widely applicable unit is the equivalent continuous A-weighted sound pressure level ($L_{Aeq, T}$). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound.

L_{AE} Where the overall noise level over a given period is made up of individual noise events, the $L_{Aeq, T}$ can be predicted by measuring the noise of the individual noise events using the sound exposure level, L_{AE} (or SEL or L_{AX}). It is defined as the level that, if maintained constant for a period of one second, would deliver the same A-weighted sound energy as the actual noise event.

L_{A1} The level exceeded for 1% of the time is sometimes used to represent typical noise maxima.

L_{A10} The level exceeded for 10% of the time is often used to describe road traffic noise.

L_{A90} The level exceeded for 90% of the time is normally used to describe background noise.

Sound Transmission in the Open Air

Most sources of sound can be characterised as a single point in space. The sound energy radiated is proportional to the surface area of a sphere centred on the point. The area of a sphere is proportional to the square of the radius, so the sound energy is inversely proportional to the square of the radius. This is the inverse square law. In decibel terms, every time the distance from a point source is doubled, the sound pressure level is reduced by 6 dB.

Road traffic noise is a notable exception to this rule, as it approximates to a line source, which is represented by the line of the road. The sound energy radiated is inversely proportional to the area of a cylinder centred on the line. In decibel terms, every time the distance from a line source is doubled, the sound pressure level is reduced by 3 dB.

Factors Affecting Sound Transmission in the Open Air

Reflection

When sound waves encounter a hard surface, such as concrete, brickwork, glass, timber or plasterboard, it is reflected from it. As a result, the sound pressure level measured immediately in front of a building façade is approximately 3 dB higher than it would be in the absence of the façade.

Screening and Diffraction

If a solid screen is introduced between a source and receiver, interrupting the sound path, a reduction in sound level is experienced. This reduction is limited, however, by diffraction of the sound energy at the edges of the screen. Screens can provide valuable noise attenuation, however. For example, a timber boarded fence built next to a motorway can reduce noise levels on the land beyond, typically by around 10 dB(A). The best results are obtained when a screen is situated close to the source or close to the receiver.

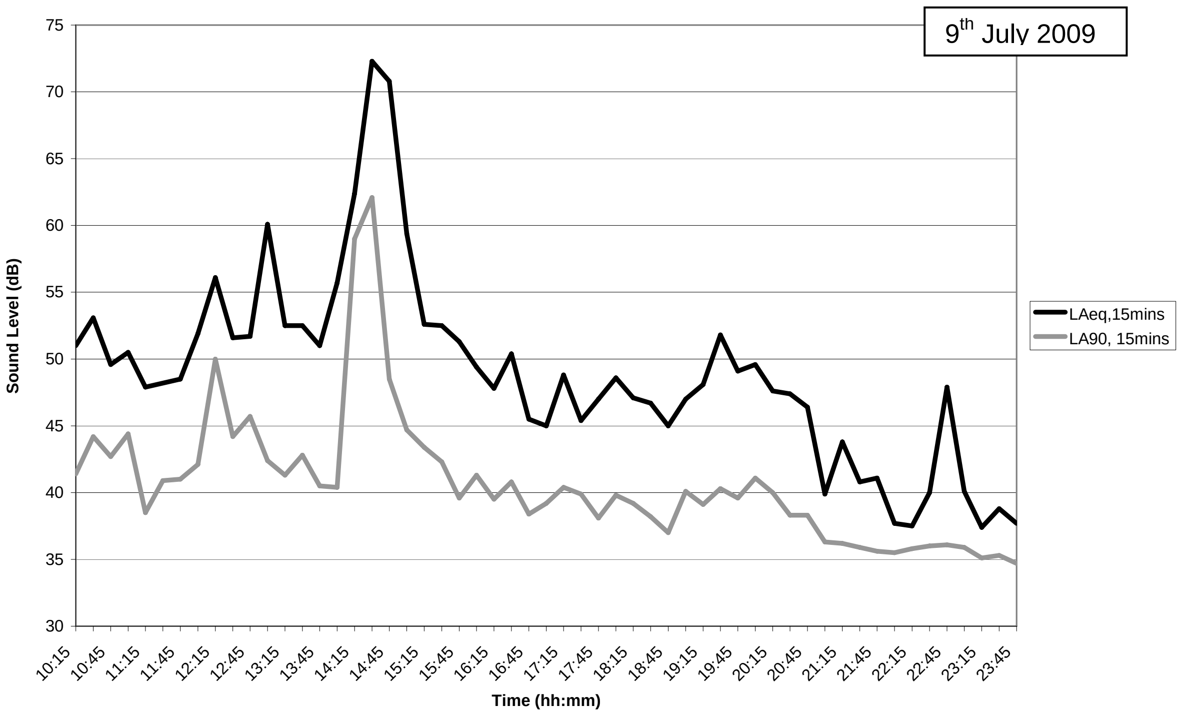
Meteorological Effects

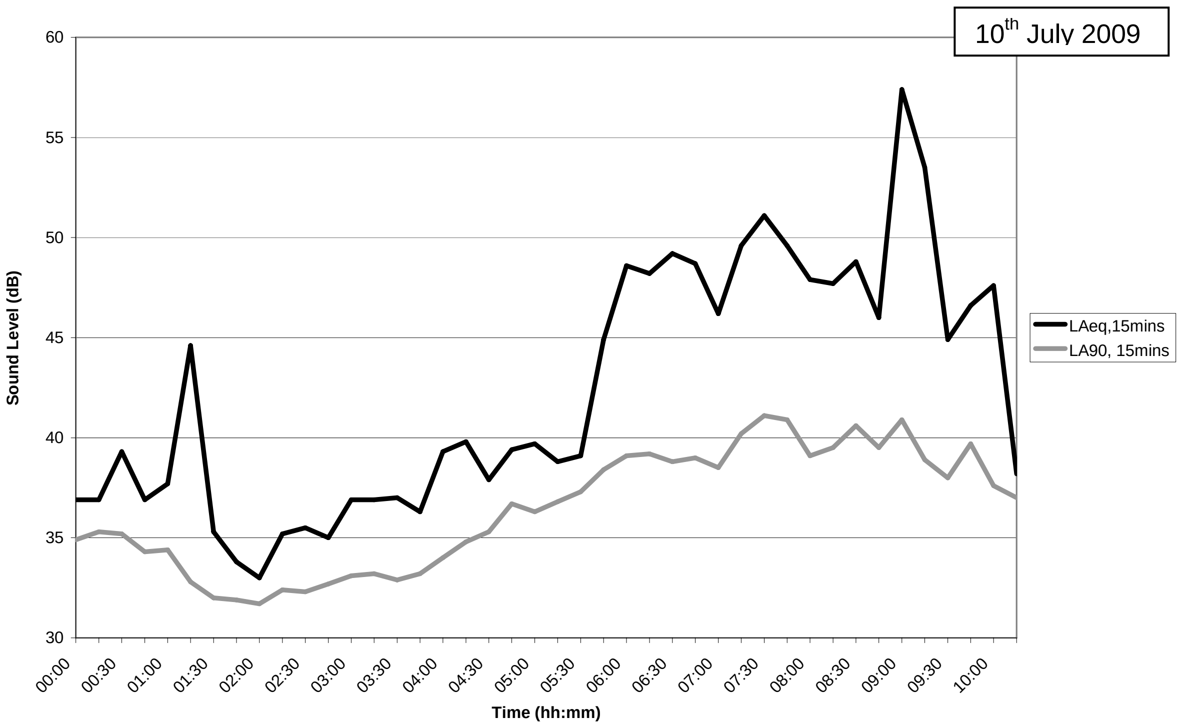
Temperature and wind gradients affect noise transmission, especially over large distances. The wind effects range from increasing the level by typically 2 dB downwind, to reducing it by typically 10 dB upwind – or even more in extreme conditions. Temperature and wind gradients are variable and difficult to predict.

APPENDIX B
NOISE SURVEY DATA

Measurement Data

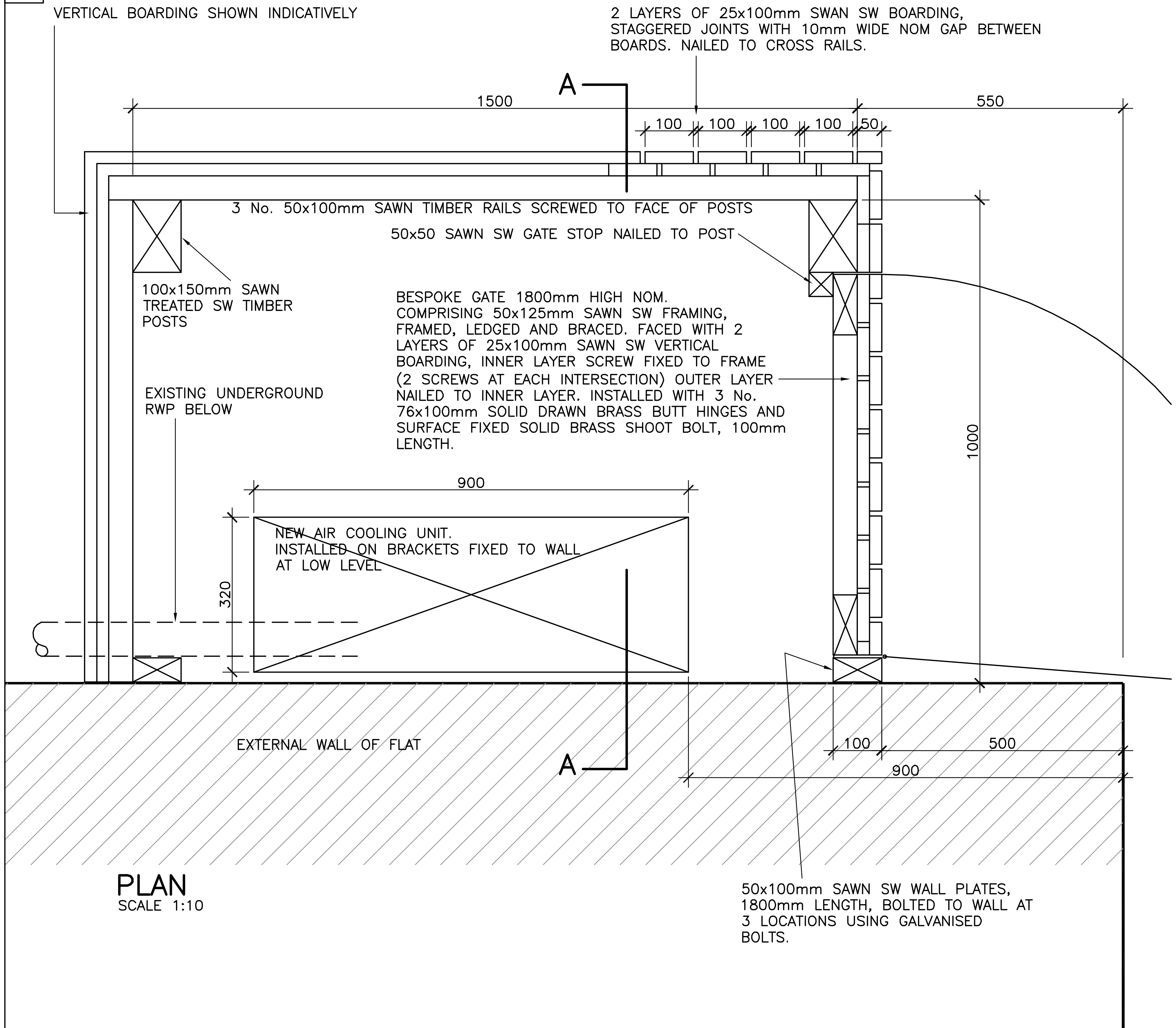
Measurements were made at 15 minute intervals using a Type 1 Sound Level Meter. The microphone was in a façade position and 1m from the position of the proposed condenser unit, as shown in Figure 1. All measurements are given in dB re 2x10^{-5} Pascals.

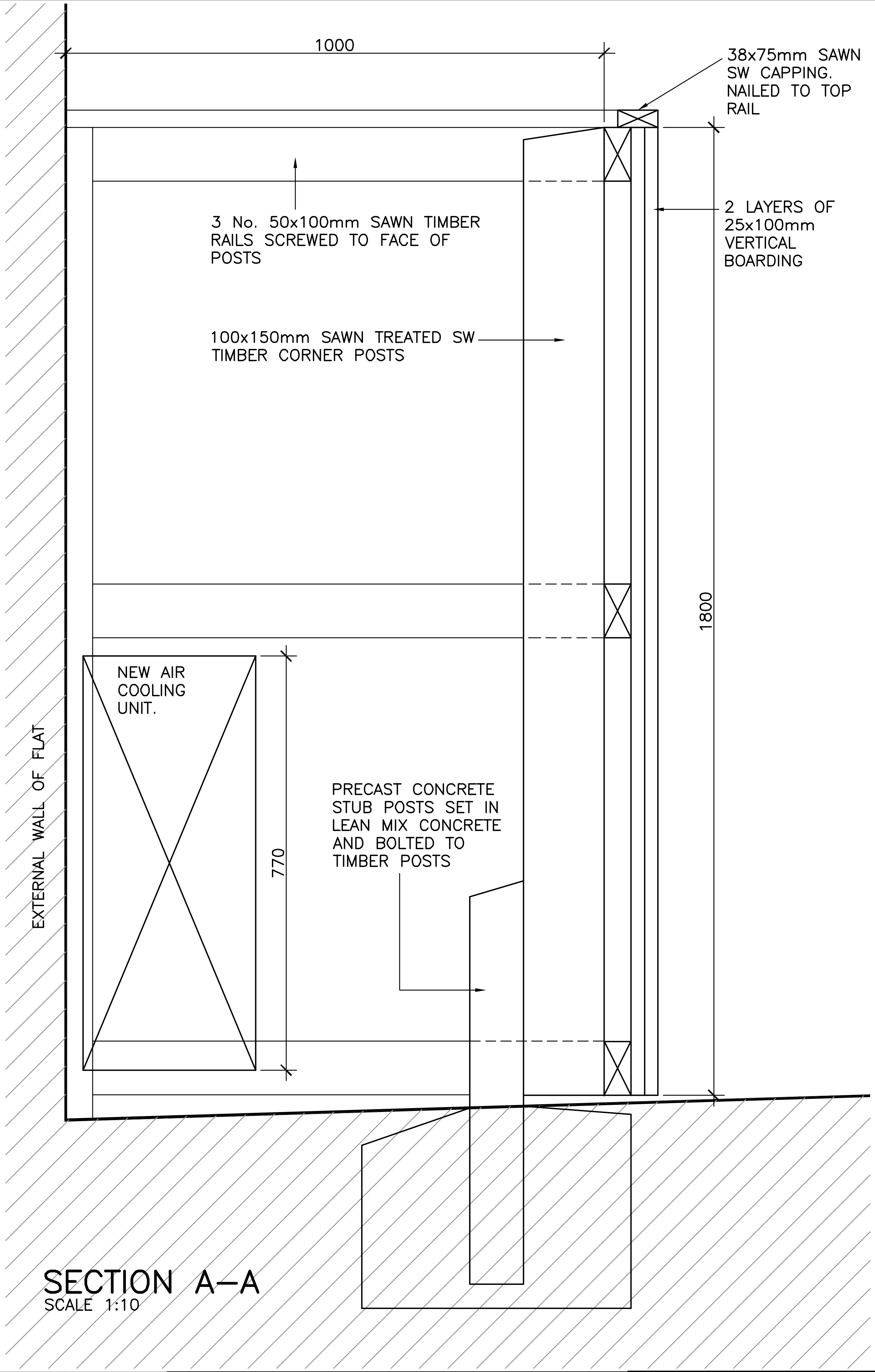




APPENDIX C
DETAILS OF PROPOSED ENCLOSURE

A3





NOTES:
ALL TIMBER TO BE SAWN SOFTWOOD, PRESSURE IMPREGNATED AND STAINED FINISH. COLOUR TO BE SELECTED BY CLIENT.
ALL SCREWS FOR TIMBER TO BE ALUMINIUM OR STAINLESS STEEL. BRASS FITIINGS TO HAVE BRASS SCREWS.
ALL NAILS ARE TO BE GALVANISED MILD STEEL.

Project: REMEDIAL WORKS 38 MILLFIELD LANE HIGHGATE	CAD Ref.		Drawn GJ	
	Date: 03.08.09	Scale: 1:5		
Drawing Title: TIMBER ENCLOSURE TO AIR COOLING UNIT	Project No. 6822	DWG. No. 6822–AA8–03	Revision -	

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CONTRACTORS, SUB-CONTRACTORS AND SUPPLIERS MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORK OR MAKING ANY SHOP DRAWINGS.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH STRUCTURAL, MECHANICAL AND ELECTRICAL DRAWINGS AND ALL OTHER RELEVANT INFORMATION AND ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECTS

ALL DIMENSIONS AND DETAILS HAVE BEEN TAKEN FROM EXISTING RECORDS AND THE CONTRACTOR IS THEREFORE REQUIRED TO CHECK DIMENSIONS AND DETAILS ON SITE