CONDITION 6

Acoustic Associates Sussex Ltd

Measurement of Existing Noise Levels & Assessment of New Plant Machinery Noise

Site: Health Centre – Former United Reformed Church
Client: Sal Rassam

Report by: Pradeep Mistry BSc(Hons) MSc AMIOA
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Acoustic Associates

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1.0 Introduction and Executive Summary

1.1 Acoustics Associates Sussex has been appointed by Sal Rassam to:

- Measure existing noise levels at the Former United Reformed Church, which is proposed to be converted to a health centre
- Predict Noise Levels of proposed new plant machinery
- Compare noise level predictions with relevant standards/criteria

1.2 At the former United Reformed Church it has been proposed to install 4 outdoor heat pumps along the Western facade of the proposed Health Centre. An air handling unit has also been proposed to be installed on the flat roof area.

1.3 It is understood that the units will operate from Monday to Friday between 07:00 Hours and 19:00 Hours.

1.4 This report provides the results summary of measurements of existing noise levels at two locations.

1.5 The measurement survey shows that the representative daytime background noise level is $L_{90(15min)}$ 42dB(A).

1.6 A computer model has been created using a software package called IMMI. The results of the model can be seen in section 5.0.

1.7 The calculated "Noise Rating Level" is 13dB(A) above the measured background noise level.

1.8 It is, therefore, considered that the Local Authority criterion for acceptability will not be met. Further discussions will be necessary in order to formulate noise attenuation measures for the external plant in order to meet the Local Authority criterion for acceptability.

2.0 Terminology

Terminology and extracts from BS4142 (Method for rating industrial noise affecting mixed residential and industrial areas (1997)) have been used in this report. For clarity a definition of certain terms can be found below:

- **Specific noise level,** $L_{Aeq,Tr}$
  The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

- **Measurement time interval,** *T*m
  The total time over which measurements are taken. NOTE. This may consist of the sum of a number of non-contiguous, short term measurement time intervals.

- **Rating level,** $L_{Ar,Tr}$
  The specific noise level plus any adjustment for the characteristic features of the noise.

- **Ambient noise**
  Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

- **Residual noise**
  The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

- **Residual noise level,** $L_{Aeq,T}$
  The equivalent continuous A-weighted sound pressure level of the residual noise.

- **Background noise level,** $L_{A90,T}$
  The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 % of a given time interval, *T*, measured using time weighting, *F*, and quoted to the nearest whole number of decibels

- **Noise Rating,** *NR*
  Noise rating (NR) is a graphical method for assigning a single number rating to a noise spectrum. It can be used to specify the maximum acceptable level in each octave band of a frequency spectrum, or to assess the acceptability of a noise spectrum for a particular application. The method was originally proposed for use in assessing environmental noise, but it is now used in the UK mainly for describing noise from mechanical ventilation systems in buildings".

3.0 Background Noise Survey Baseline Conditions and Results

3.1 Site: Former United Reformed Church, Shelley Road, Worthing

3.2 Survey Engineer: Pradeep Mistry BSc(Hons) MSc AMIOA

3.3 Survey Date; 19/01/2011

3.4 Equipment used:

- Norsonic 118 Class 1 Real Time Noise Analyser
- Wind Shield
- Castle GA607 Class 1 Acoustic Calibrator
- Tripod

The meter was calibrated before commencing the noise measurements (@94dB). The calibration was re-checked at the end of the measurements to ensure that no calibration drift had occurred. After survey the calibration showed no significant drift (94dB)

3.5 Weather condition

- Dry
- Wind speed average less than $2ms^{-1}$

3.6 Free field Adjustment

Measurements were taken at three locations around the site; all positions were 1.5m from the ground and 3.5m from the nearest facade. Taking into account the location of the microphone positions, it follows that all measurements are free field measurements, therefore no correction is required.

3.7 Microphone Positions

Measurement 1, as seen in figure 1 was located at the rear of 13 Chandos Road, Worthing. This was positioned more then 3.5m from the nearest noise sensitive property. Measurement 2 was located in the existing car park which serves the Church. It was positioned to represent a typical noise level at 7 Shelley Road, which is the nearest noise sensitive property. We were unable to gain access to the church, but we believe position 2 to provide a fair representation of the noise levels at the nearest noise sensitive property.

3.8 Measurement Details

- Background Noise

  The background noise levels were measured during the daytime, the proposed health centre is proposed to be open until 19:00hrs Monday – Friday. The daytime measurements were carried out between 14:30hrs to 15:30hrs.

3.9 Site layout and proposed air conditioning units

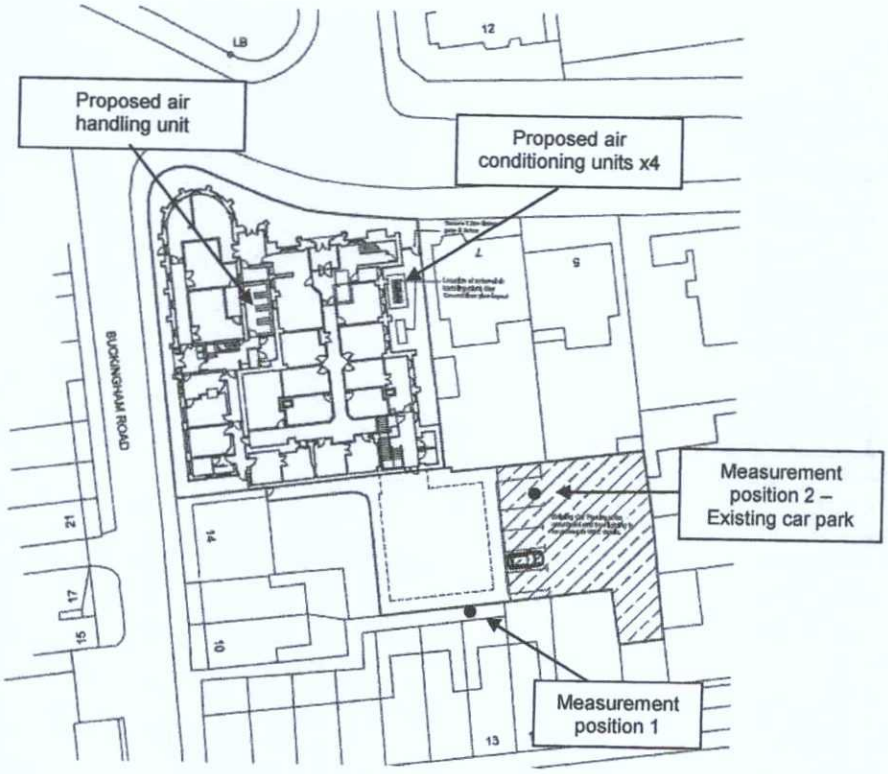

Figure 1 – Site layout and proposed units

Figure 1 shows the proposed units to be installed. The four air conditioning units have been proposed to be installed on ground level along the Eastern facade of the site. The air handling unit is proposed to be installed on a small area of flat roof as shown in figure 1.

3.10 Measured Specific Noise Level

The measurement results can be found in the table below:

Measurement Type	Measurement Time	Measurement Duration	L_{A90} dB(A)	L_{Aeq} dB(A)
Background Noise Pos 1	14:35	15 Mins	38.7	53.3
Background Noise Pos 2	14:50	15 Mins	42.4	56.4
Background Noise Pos 2	15:05	15 Mins	41.9	54.8

Figure 2 – Measured background noise levels

Background noise level, $L_{A90,T}$ is the A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T.

The lowest measured background noise level was 39dB(A) at position 1, however, we have based the most representative background noise level at position 2, as we feel this is a better representation of the noise level at 7 Shelley Road, as this is the nearest noise sensitive property of most concern.

The results above show that the representative background noise level would be approximately 42dB(A).

4.0 Proposed Units

4.1 New Plant Machinery Layout

As part of the new health centre, it has been proposed that air conditioning units and an air handling unit are to be installed on site. The nearest noise sensitive property is 7 Shelley Road. However, our computer model has also considered other properties around the site. The table below shows the A-weighted octave band noise data for each different model that has been proposed.

	Octave Band Centre Frequency (Hz)								
	63	125	250	500	1k	2k	4k	8k	Sound Pressure Level dB(A) @1m
PUHY-HP400 SHM-A (x4)	50	53	58	58	58	55	51	42	64
Ecovent-NRG Size 8 (x1)	43	53	57	50	46	45	35	30	60

The total noise level produced by the four proposed heat pump units is 70dB(A) @1m. This is the worst case scenario, when all units will be running at their full capacity. The table above shows in brackets how many of each model will be installed.

5.0 IMMI Computer Noise Model

In order to see how the proposed units will affect the nearest noise sensitive property, we have produced a basic computer model using the computer package IMMI. We have used the measurement survey data and architect plans to produce the model.

The model was calibrated first by completing a noise model detailing the empty site. We placed a noise source onto the model and adjusted this until it matched the manufacturer's noise level data; we then added the further proposed units and adjusted the levels until the noise level matched the sound pressure level for each of proposed units. We have used the worst case positions, as we believe this is the nearest noise sensitive property.

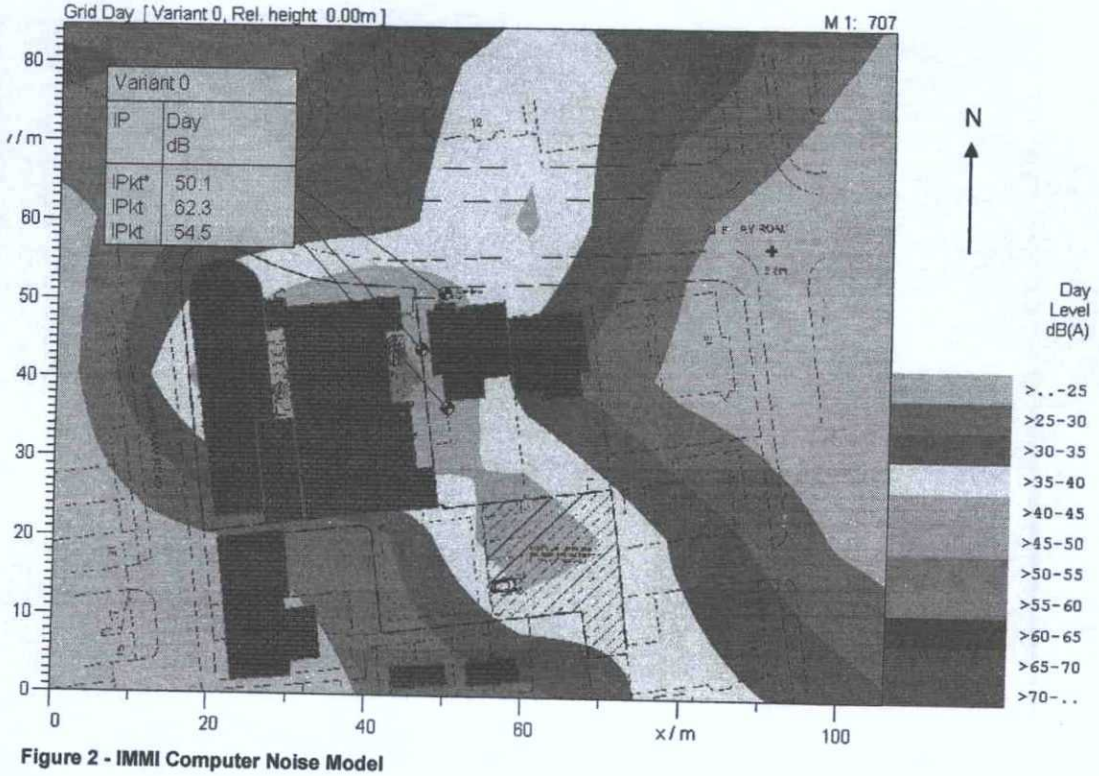

Figure 2 - IMMI Computer Noise Model

Figure 2 shows that the noise level at the reception point just outside the residences is between 50dB(A) and 62dB(A). The modeled reception points were positioned at the height of the 1st floor windows. The principal source for these 'received' noise levels is the bank of heat pumps outside the East façade. The air handling unit on the flat roof contributes a significantly lower degree of energy and is not significant.

We have gathered results based on three reception points. It was noted on site that windows and a door were present on the Western facade, which we speculate are windows to a landing and bathroom.

We believe the reception points placed on the Northern and Southern facades are more representative of noise levels at habitable windows.

6.0 Noise Criteria & Assessment

6.2 Local Environmental Health External Noise Criterion

The Local Environmental Health Criterion is that the rating level of noise produced by an industrial source must be at least 5dB below the background noise (L_{A90}) just outside the nearest habitable room window.

With regard to rating level BS4142 states the following:

"Before the measured and calculated noise can be compared to the Local Environmental Health Criterion for Noise the rating level will need to be established. Certain acoustic features can increase the likelihood of complaint. The BS4142 standard states that 5dB should be added to the specific noise to obtain the rating level if:

a) The noise contains a distinguishable, discrete continuous note (tonal)
b) The noise contains distinct impulses.
c) The noise is irregular enough to attract attention.

The frequency profile information supplied for the heat pump units does not suggest that they will exhibit tonality and so the 5dB penalty is not considered to be applicable in this case.

With regard to assessment method BS4142 states the following:

"Assess the likelihood of complaints by subtracting the measured background noise level from the rating level"

"The greater this difference the greater the likelihood of complaints.

a) A Difference of around +10dB or more indicates that complaints are likely
b) A difference of around +5dB is of marginal difference.
c) If the rating level is more than 10dB below the measured background noise level then this is a positive indication that complaints are unlikely".

Based on the IMMI computer model. Therefore, the Rating Level at the nearest noise sensitive window will not meet the council's requirements of being at least 5dB below the background noise level.

Therefore, it is suggested that an enclosure is installed around the proposed air conditioning units on the ground floor.

7.0 Conclusion

Section 5 and 6 demonstrated that the calculated rating level will be 62dB(A) at the nearest residential property. However, we are basing results on the Southern facade which gave a noise level of 55dB(A) as we believe it is a more representative noise level at a habitable window.

The predicted noise level is 13dB higher than the representative background noise level. Therefore, with respect to the nearest noise sensitive property, the Local Authority's noise criterion will not be satisfied.

The main concern relates to the four air conditioning/heat pump units proposed to be installed on ground level. The air handling unit is to be installed on the flat roof area as shown in figure 1. The noise levels emitted from the air handling unit will be attenuated by the pitched roof of the church.

It is therefore recommended in order to meet the Local Council's requirements that consideration be given to the installation of an enclosure around the proposed air conditioning units or that they be re-located or both.

It is recommended that further discussions will be necessary in order to devise a suitable method for attenuating the noise from these units.

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