Report No. R2489-1
Issued on 17th April 2007

An Assessment of the impact of noise from the proposed condenser units at The Chesterfields 115-117 Regent's Park Road, NW1 8UR

* * *

For a planning application

Prepared for:
Neale & Norden Limited
Architects
19 – 23 White Lion Street
London N1 9PD

Prepared by:
Tom Brodowski MIOA
Noise & Vibration Engineering Limited
1 Rothesay Avenue
London SW20 8JU

Tel: 020 8542 9226
Email: tbrodowski@noise-vibration.co.uk

1. Introduction

Neale & Norden (Architects) are erecting new roof top (mansard) flats at the Chesterfields, 115-117 Regent's Park Road, London NW1 8UR. Their client wishes to include comfort air cooling.

As part of a planning application it is required to satisfy Camden Council that the noise produced by the outdoor condenser units will not cause a nuisance.

Neale & Norden have commissioned Noise & Vibration Engineering Limited (NVE) to carry out a noise survey and prepare a report to demonstrate compliance with the Camden Council's noise requirements.

2. The Site and the Proposed Condenser Units

It is proposed to install two Daikin outdoor condenser units (Model 5MXS90E7V3B) on the flat roof over the common parts of the premises. For the location see Figure 2 and Photos. Manufacturers' specification of the units is presented in Appendix B.

The units will be installed against the parapet wall, which is approximately in line with the façade in which the nearest noise-sensitive window will be situated. A distance between the proposed units and the nearest noise-sensitive window will approximately be 6m.

3. The Camden Council's Noise Requirements

The installation of plant and machinery

- Identification of the lowest background noise levels at the nearest noise sensitive premises.
- The assessment shall be sufficient to identify the lowest background level over the proposed operational period of the plant.
- Details of the proposed plant including manufacturers' product specifications shall be attached which should include noise output.
- Assessment to determine whether the cumulative noise levels of the proposed plant would comply with Camden's noise standards in relation to nearest noise sensitive facades (i.e. can it achieve either 5dBA or 10dBA below background levels at the nearest noise sensitive windows in residential properties).
- In the event the plant does not comply with Camden's planning criteria details of required noise reduction strategies including means of attenuation or isolation necessary to ensure that the proposed plant complies with noise standards.
- Details of methods and examples of any calculations and assumptions used should be included in the report.

4. The Method of Assessing the Impact of Noise

The evaluation and analysis of the results was carried out in accordance with both BS 4142: 1997. This standard describes a method of determining the level of a noise of an industrial nature, together with procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity.

Response to noise is subjective and affected by many factors (acoustic and non-acoustic). In general the likelihood of complaint in response to a noise depends on factors including the margin by which it exceeds the background noise level, its absolute level, time of day, changes in noise environment etc., as well as local attitudes to the premises and the nature of the neighbourhood.

The BS 4142 is only concerned with the rating of a noise of an industrial nature, based on the margin by which it exceeds a background noise level with an appropriate allowance for the acoustic features present in the noise. As this margin increases, so does the likelihood of complaint.

5. The Noise Survey & Results

The noise survey was carried out over a 24 hour period, i.e. between 2 pm on Thursday, 12th April and 2pm on Friday, 13th April 2007. It consisted of measuring the level of the existing background noise at the nearest noise-sensitive window from the proposed condenser units, see Figure 2 and Photos.

A microphone was positioned just outside the tarpaulin attached to the scaffolding poles approx. 1.5m in front of the nearest noise-sensitive window, which is situated approx. 6m away from the proposed condenser units.

Throughout the survey it was warm, dry and there were occasional light breezes.

For this purpose the following instrumentation was used: the SIP95 Sound Level Meter (Serial No. 010663) together with a type MK250 Microphone (Serial No. 4023) and type PRE12N Preamplifier was laboratory calibrated by the manufacturers (01dB MVI technologies group) in December 2004.

The sound level meters was checked for calibration just before and after the measurements with a B&K 4231 Sound Level Calibrator (Serial No. 2084931), which was laboratory calibrated by (AVI Ltd) in January 2005. No drift in the measurement level has been observed.

The measurements of the existing background noise levels in terms of $L_{A90,\ 15\text{-}m}$ are presented in a tabular format in Table 1. A time history of noise in terms $L_{Aeq,\ 10\text{-}s}$ is also presented in a graphical format in Chart 1.

For the Glossary of Terms and Noise Principles see Appendix A.

6. Evaluation and analysis of the cumulative noise level

From the results it can be seen that the lowest free-field background noise level was at 41 *and 37dB,* $L_{A90,\ 15\text{-}m}$ *during the daytime and night-time periods respectively.*

The proposed Daikin 5MXS90E7V3B condenser units can operate in "daytime" and "night-time" modes.

In the "daytime" mode one unit runs at a maximum 52 dB @ 1m distance (two units would result in a maximum 55 dB @ 1m distance). This level of noise would attenuate by 16 dB at a distance of 6m from the condenser units, i.e. to 39 dB. In addition to the above the noise level will attenuate by further 3 dB, (i.e. to 36 dB), due to the angle of view.

In the "night-time" mode the two units will run at 46 dB @ 1m distance. This level will attenuated to 30 dB at a distance of 6m and will reduce further to 27 dB due to the angle of view,

It can be expected that there would be no acoustic features present in the noise from the proposed A/C unit, which means that the rating level would be equal to the specific noise level, i.e. at 36 dB and 27 dB during the daytime and night-time respectively.

A difference between the existing background noise level and the rating level is:

During the daytime (36 - 41) dB = -5 dB;
During the night-time (27 – 37) dB = -10 dB

From the above it can be seen that a minimum 5 dB below background level can be achieved at the nearest noise sensitive windows in residential properties.

7. Conclusions

We can, therefore, conclude that the cumulative noise levels of the proposed condenser units would comply with Camden's noise requirements.

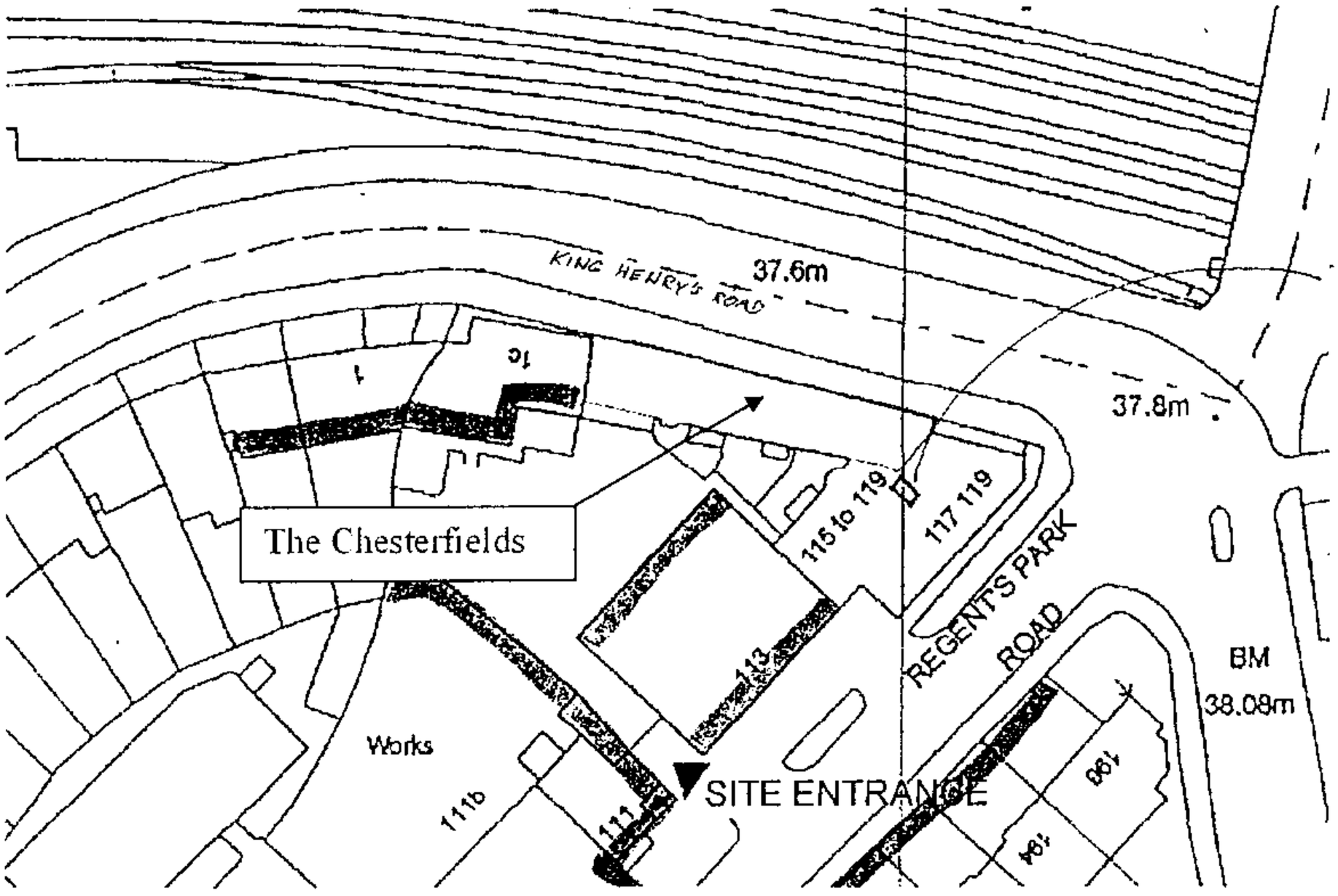


Figure 1. Location Plan (N.T.S.)

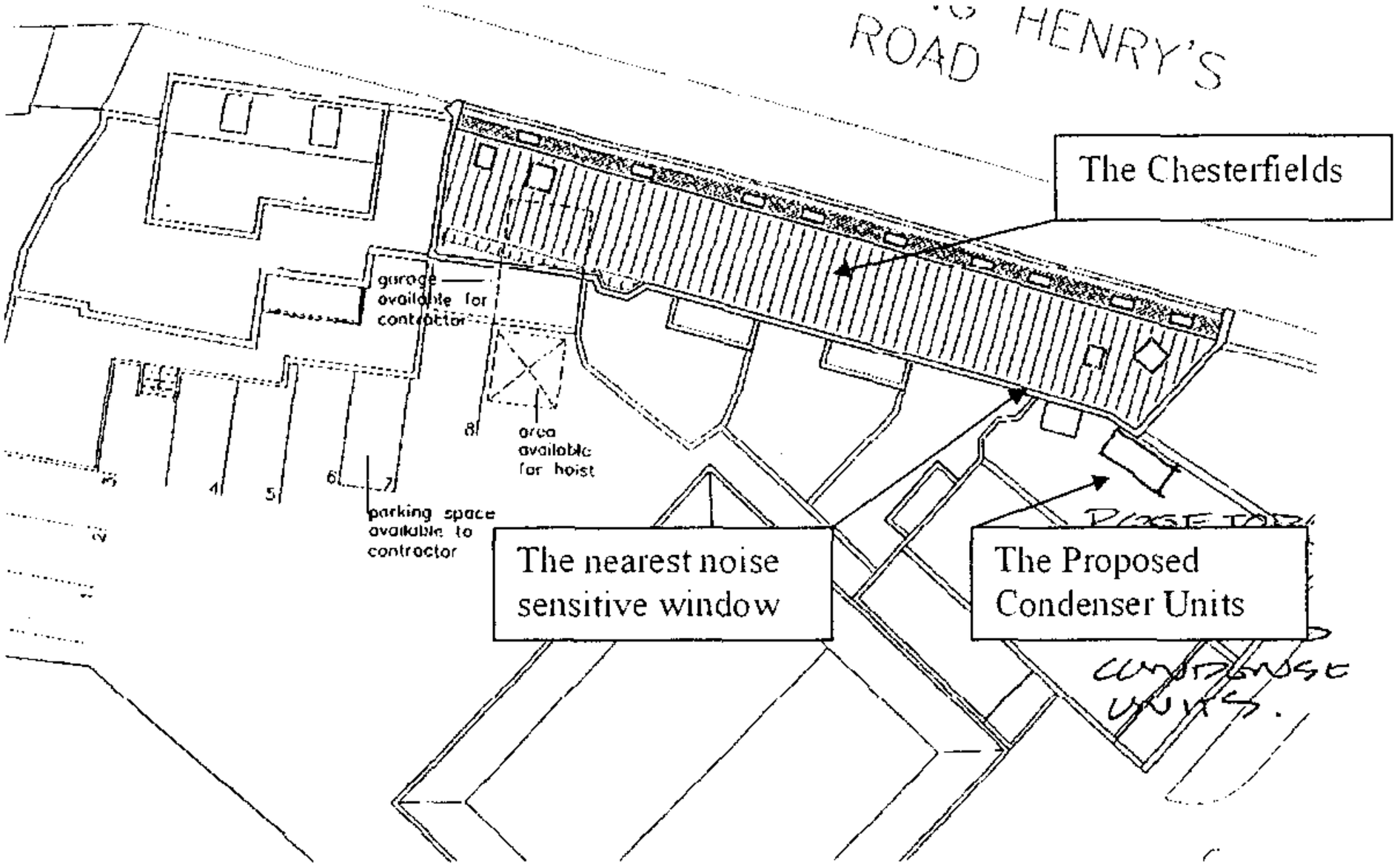
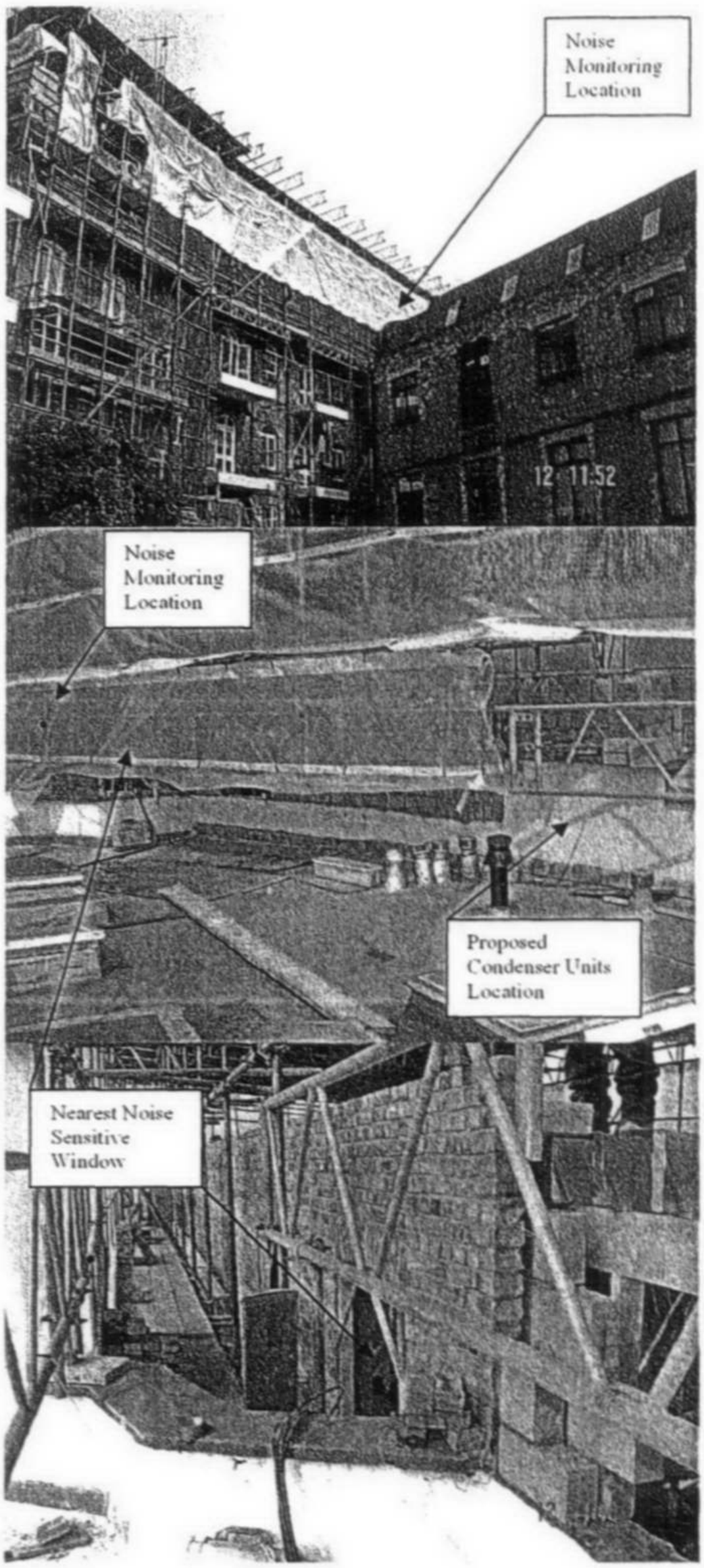


Figure 2. Roof plan showing the location of the proposed units and the nearest noise-sensitive window (n.t.s.)



Photographs

RESULTS OF THE NOISE SURVEY

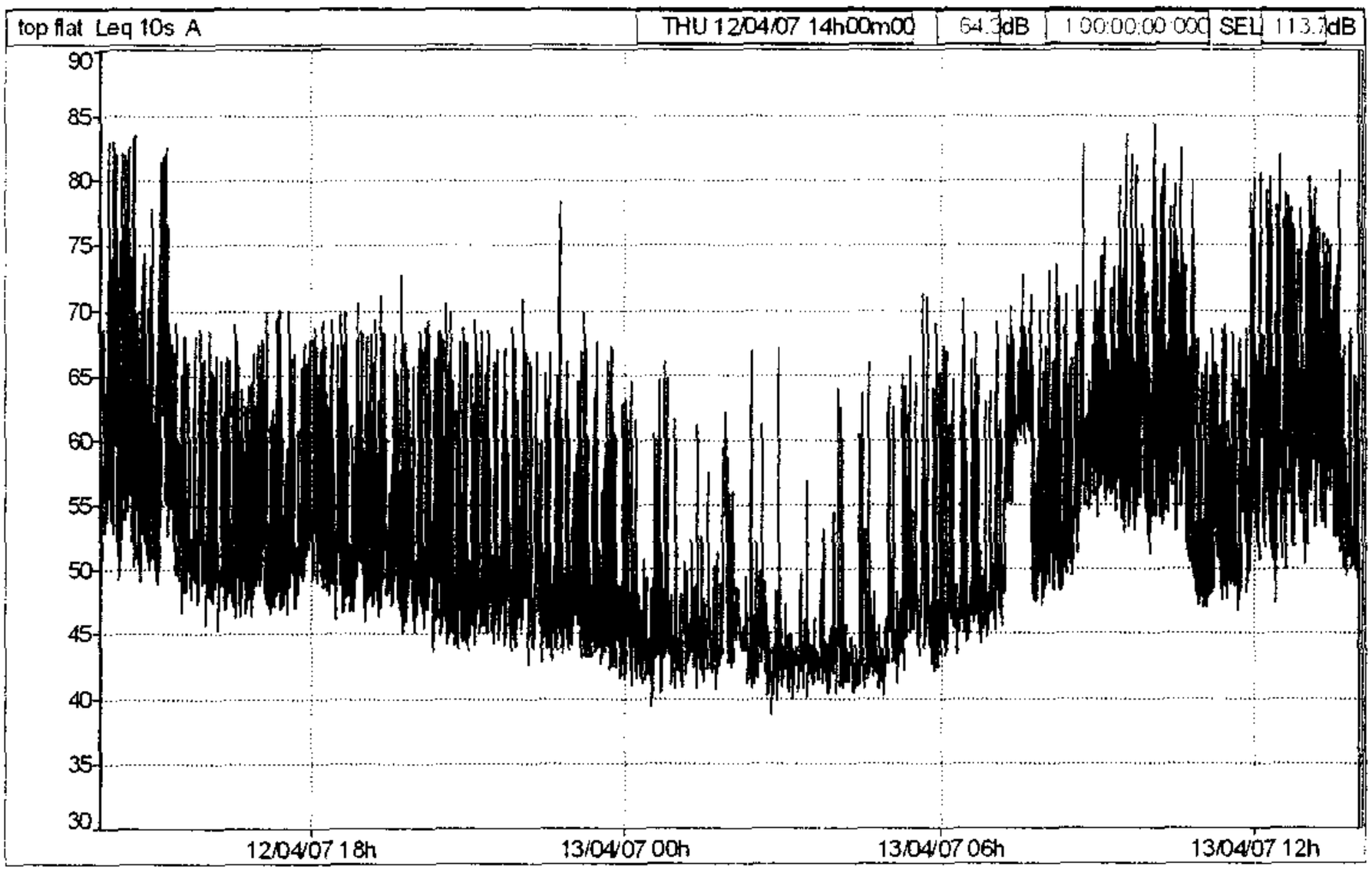


Chart 1. Time History of the Noise

Daytime (0700-2300)			**Night-time (2300-0700)**		
Periods	15m		Periods	15m	
Start	12/04/07 14:00:00:000		Start	12/04/07 14:00:00:000	
End	13/04/07 14:00:00:000		End	13/04/07 14:00:00:000	
Location	top flat		Location	top flat	
Weighting	A		Weighting	A	
Elementary Duration	125ms		Elementary Duration	125ms	
Unit	dB		Unit	dB	
Period start	**Leq**	**L90**	**Period start**	**Leq**	**L90**
13/04/2007 07:00	56	45.8	12/04/2007 23:00	53.9	44.3
13/04/2007 07:15	63.6	55.2	12/04/2007 23:15	56.5	43.1
13/04/2007 07:30	64.2	60.3	12/04/2007 23:30	52.4	43.4
13/04/2007 07:45	58.7	47.7	12/04/2007 23:45	54.7	42.2
13/04/2007 08:00	62.6	48.7	13/04/2007 00:00	51.9	42.1
13/04/2007 08:15	59.4	48.4	13/04/2007 00:15	47.3	41.9
13/04/2007 08:30	65.3	50.2	13/04/2007 00:30	50.3	40.5
13/04/2007 08:45	63.1	53.3	13/04/2007 00:45	52.1	42.1
13/04/2007 09:00	64	54.2	13/04/2007 01:00	45.2	41.6
13/04/2007 09:15	67.5	53.5	13/04/2007 01:15	47.6	41.5
13/04/2007 09:30	69.6	52.3	13/04/2007 01:30	45.7	41.9
13/04/2007 09:45	68.6	52.2	13/04/2007 01:45	54.9	42.3
13/04/2007 10:00	72.2	52.1	13/04/2007 02:00	46.7	43.1
13/04/2007 10:15	69.6	52.4	13/04/2007 02:15	51	41.3
13/04/2007 10:30	69.2	49.7	13/04/2007 02:30	49.5	41
13/04/2007 10:45	65.8	47.4	13/04/2007 02:45	49.9	**40**
13/04/2007 11:00	57.5	47.3	13/04/2007 03:00	**42.8**	40.7
13/04/2007 11:15	58.4	48	13/04/2007 03:15	45	40.6
13/04/2007 11:30	57	47.5	13/04/2007 03:30	43.5	41.4
13/04/2007 11:45	65.9	48.6	13/04/2007 03:45	45.2	40.9
13/04/2007 12:00	70	49.5	13/04/2007 04:00	49.7	41
13/04/2007 12:15	71.6	48.5	13/04/2007 04:15	48.3	40.8
13/04/2007 12:30	72.2	49.9	13/04/2007 04:30	50	41.3
13/04/2007 12:45	67.7	50	13/04/2007 04:45	43.1	40.8
13/04/2007 13:00	71.8	51.4	13/04/2007 05:00	50.5	41.7
13/04/2007 13:15	68.2	51.4	13/04/2007 05:15	54.1	42.6
13/04/2007 13:30	66.2	50.1	13/04/2007 05:30	57.3	43.5
13/04/2007 13:45	57.3	49.8	13/04/2007 05:45	57.5	42.2
12/04/2007 14:00	70	50.4	13/04/2007 06:00	54.6	43.4
12/04/2007 14:15	72.9	49.2	13/04/2007 06:15	55	44.4
12/04/2007 14:30	73.5	49.2	13/04/2007 06:30	56	45
12/04/2007 14:45	66.8	49	13/04/2007 06:45	52.4	44.9
12/04/2007 15:00	71.8	49.1	**Quietest Period**	**42.8**	**40** **façade**
12/04/2007 15:15	67.7	49.5			**37** **free-field**
12/04/2007 15:30	58.4	47.5		**Leq**	**L90** **index**
12/04/2007 15:45	58.5	47.8		**dBA**	**dBA** **unit**

12/04/2007 16:00	57.8	46.9		
12/04/2007 16:15	56.6	46.6		
12/04/2007 16:30	57	46.6		
12/04/2007 16:45	56.4	46.6		
12/04/2007 17:00	58.7	47.5		
12/04/2007 17:15	58.2	46.9		
12/04/2007 17:30	56.8	47.3		
12/04/2007 17:45	57.4	48.9		
12/04/2007 18:00	60.2	49.2		
12/04/2007 18:15	57.9	47.9		
12/04/2007 18:30	59.4	47.3		
12/04/2007 18:45	58	47.5		
12/04/2007 19:00	58.3	47		
12/04/2007 19:15	57.3	47.2		
12/04/2007 19:30	60.2	47.2		
12/04/2007 19:45	56.7	46.4		
12/04/2007 20:00	57.8	45.8		
12/04/2007 20:15	59.1	44.9		
12/04/2007 20:30	58.9	44.9		
12/04/2007 20:45	55.5	44.2		
12/04/2007 21:00	57.5	44.6		
12/04/2007 21:15	57.1	45.3		
12/04/2007 21:30	56.6	44.8		
12/04/2007 21:45	56.8	44.4		
12/04/2007 22:00	59.5	45.1		
12/04/2007 22:15	56.4	44.1		
12/04/2007 22:30	**54.9**	**43.7**		
12/04/2007 22:45	62.6	43.8		
Quietest Period	**54.9**	**43.7**	**façade**	
		41	**free-field**	**whole number**
	Leq	**L90**	**index**	
	dBA	**dBA**	**unit**	

Table 1. Results of the Noise Survey

APPENDIX A

Glossary of Terms

A-weighted sound pressure level

The unit generally used for measuring and assessing environmental noise is A-weighted sound pressure level in decibels, denoted dB(A). The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. It is worth noting that an increase or decrease of approximately 10 dB(A) corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 2 to 3 dB(A) is subjectively barely perceptible.

$L_{Aeq,T}$

The equivalent continuous sound level is a notional steady sound level which would, over a given period of time, deliver the same sound energy as the actual fluctuating sound over the same period and is denoted $L_{Aeq,T}$. It is the unit which has been adopted to cover many forms of environmental noise from construction and open sites, mineral working, industrial noise and noise from railway trains. It is also by definition the only unit which can measure ambient noise, which itself is defined as the totally encompassing sound in a given situation at a given time usually being composed of sound from many sources near and far.

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 the given time interval, T,

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.

Specific noise source

The noise source under investigation for assessing the likelihood of complaints

Reference time interval, T_r

The specified interval over which an equivalent continuous A-weighted sound pressure level is determined

Rating level, $L_{Ar,Tr}$

The specific noise level plus any adjustment for the characteristic features of the noise.

Distance attenuation

The noise from a person talking will reduce by 6 dB for each doubling of the distance between source and listener, i.e. raised male speaking voice which is typically 65 dBA at one 1 metre will be 59 dBA at 2 metres, 53 dBA at 4 meters, and so on. The noise propagation from a point source in a free space is in accordance with the inverse square law by which sound pressure level decreases by 6 dB per doubling of the distance from the source.

The noise from the road traffic will reduce by 3 dB for each doubling the distance between the road and receiver, provided there are no reflective surfaces, such as the concrete or asphalt. The noise propagation from a line source situated near the ground is in accordance with unidirectional hemispherical propagation, i.e. sound pressure level decreases by 3 dB per doubling the distance between the source and receiver.

APPENDIX B

Daikin Outdoor Condenser Units (Model 5MXS90E7V3B)

2 Specifications

2-1 TECHNICAL SPECIFICATIONS				2MXS40DAVMB	3MXS52E2V1B	3MXS52E7V1B	4MXS68E2V1B	4MXS80E7V3B	5MXS90E7V3B
Casing	Colour			Ivory White					
Dimensions	Unit	Height	mm	640	735	735	735	770	770
		Width	mm	665	936	936	936	900	900
		Depth	mm	265	300	300	330	320	320
	Packing	Height	mm	575	797	797	784	900	900
		Width	mm	900	992	992	992	925	925
		Depth	mm	365	390	390	390	390	390
Weight	Unit		kg	38	49	49	59	72	73
	Packed Unit		kg	42	58	58	66	80	80
Heat Exchanger	Dimensions	Length	mm	678	845	845	845	860	860
		Nr of Rows		1	2	2	2	2	2
		Fin Pitch	mm	1.4	1.80	1.80	1.80	1.40	1.40
		Nr of Stages		28	32	32	32	34	34
	Tube type			Hi-Xa(8)	ø7.94 grooved tubes 24	ø7.94 grooved tubes 24	Hi-Xa(8)	Hi-XSS(8)	Hi-XSS(8)
	Fin	Type		WF fin	Colgate fin	Colgate fin	WF fin	WF fin	WF fin
		Treatment		Anti-corrosion treatment (PE)	Anti-corrosion treatment (PE)	Anti-corrosion treatment (PE)	Anti-corrosion treatment (PE)		
Fan	Type			Propeller					
	Quantity			1	1	1	1	1	1
	Air Flow Rate (nominal at 230V)	Cooling	m³/min	35	45.0	45.0	51.0	54.5	54.5
		Heating	m³/min	32	45.0	45.0	47.6	48.0	
	Motor	Quantity		1	1	1	1	1	1
		Model		D50E-28	KFD-360-50-8A	KFD-360-50-8A	KFD-360-53-8C	KFD-280-68-8A	KFD-280-68-8A
Motor	Speed (nominal)	Cooling	rpm	880	720	720	790		860
		Heating	rpm	880		720	790		
Fan	Motor	Output	W	50	53	53	53	66	66
Compressor	Quantity				1	1	1	1	1
	Motor	Model		1YC23DXD	2YC36BXD	2YC36BXD	2YC45BXD	2YC63BXD#C	2YC63BXD#C
		Type		Hermetically sealed swing compressor					
		Motor Output	W	800	1100	1100	1350	1920	1920
Operation Range	Cooling	Min	°CDB	10	-10.0	-10.0	-10.0	-10.0	-10.0
		Max	°CDB	46	46.0	46.0	46.0	46.0	46.0
	Heating	Min	°CWB	-10	-15	-15	-15	-15	-15
		Max	°CWB	15.5	15.5	15.5	15.5	15.5	15.5
Sound Level (nominal)	Cooling	Sound Power	dBA	62	59.0	59.0	61.0	62.0	63.0
		Sound Pressure	dBA	47	46.0	46.0	48.0	48.0	52.0
	Heating	Sound Pressure	dBA	46	47.0	47.0	49.0	49.0	52.0
Sound Level (Night quiet)	Sound Pressure		dBA	43					
Refrigerant	Type			R-410A					
	Charge		kg	1.20	2.0	2.0	2.8	3.0	3.0
Refrigerant Oil	Type			FVC50K					
	Charged Volume		l	0.40	0.85	0.85	0.75	0.75	0.75