

Fox Court 14 Gray`s Inn Road

The Trustees of Rockspring Hanover Property Unit Trust

Noise Assessment



REPORTED BY: Jaroslaw Gil MSc, MIOA, MIDiagE

CHECKED BY: Chris Gilbert MIOA, MIDiagE

DATE: February 2013

SUMMARY

An assessment has been carried out by Acoustic Associates (Peterborough) of the fixed plant associated with the proposed new building at Fox Court, 14 Grays Inn Road, London. The assessment showed that the noise levels are likely to be acceptable, in line with British Standard BS 4142: 1997 guidance, provided noise mitigation measures are

implemented, as described in Section 3 of this report.

CONTENTS

Page No.

1	OBJECTIVES	.5
2	CONCLUSIONS	.5
3	RECOMMENDATIONS	.5
4	BACKGROUND	.6
5	NOISE ASSESSMENT	.6
6	RESULTS	.9
REF	FERENCES1	1
APF	PENDIX 1 – Glossary of Terms1	12
APF	PENDIX 2 - Noise Instrumentation1	13
APF	PENDIX 3 - Results of Long-Term Noise Monitoring on Site1	4
APF	PENDIX 4 – Computer Model Output1	15
FIG	URE 1 – Location Plan of the Site1	17
FIG	URE 2 – Computer Model View1	8

1 OBJECTIVES

- **1.1** To carry out a *noise assessment of fixed plant associated with a proposed new building at Fox Court, in accordance with British Standard BS 4142: 1997 (Reference 1).
- **1.2** To recommend solutions to any problems identified by the assessment.

2 <u>CONCLUSIONS</u>

- **2.1** A BS 4142 Assessment Level of -5 dB was taken as an appropriate noise criteria for this assessment.
- **2.2** The noise levels are likely to be below the above criteria provided the noise emissions from the retail unit refrigeration plant are controlled. See other recommendations in section 3.

3 **RECOMMENDATIONS**

- 3.1 This report should be used in support of the planning application for the above proposal.
- **3.2** The noise emissions of the retail unit refrigeration plant should be controlled in one of the two ways described below:
 - Low noise level design: The equipment should be designed so that the total sound power level (L_{wA}) does not exceed 67 dB(A), or that the noise level (SPL) does not exceed 56 dB(A) at 1 m.
 - Acoustic enclosure / louvre: Assuming that the total sound power level (L_{wA}) of the plant is 96 dB(A) (or SPL = 85 dB(A) at 1 m), the equipment should be housed inside the building or in an acoustic enclosure with sound attenuating louvres. The noise level measured at 1 m from the enclosure / louvres should not exceed 56 dB(A). This means that the enclosure and louvres should achieve an insertion loss (IL) of at least 29 dB(A). Note: only an overall IL value is given in this report. However, the IL should cover a wide frequency spectrum, including low frequencies from 63 Hz.
- 3.3 The air handling units (AHU) should be designed so that the total sound power level (L_{wA}) does not exceed 77 dB(A), or that the noise level (SPL) does not exceed 66 dB(A) at 1 m. The AHU can be mounted on the existing roof, as shown in Figure 1. The equipment should not be placed closer than 2 m from any edge of the roof.

* See Appendix 1 for Glossary of Terms

4 BACKGROUND

It is proposed to build a new three storey building in the court yard of Fox Court, 14 Grays Inn Road, London (See Figure 1). The proposed building would accommodate a retail unit on the ground floor and offices on higher floors. MBA Consulting Engineers Ltd. have appointed Acoustic Associates (Peterborough) to undertake an environmental noise assessment of the plant associated with the proposed building. The assessment is conducted with respect to BS 4142. This report documents that assessment.

5 NOISE ASSESSMENT

5.1 Noise Standards

Noise from industrial sources radiated to residential areas is usually assessed against British Standard BS4142:1997, 'Method for Rating industrial noise affecting mixed residential and industrial areas' (Reference 1). This standard describes a method for assessing whether the 'specific noise' from an industrial source is likely to give rise to complaints from residents of the adjacent dwellings. The 'specific noise' levels are determined outside dwellings. The specific noise level is determined for reference time periods of 1-hour for the daytime (7am to 11pm) and 5 minutes for the night time. Tonal or impulsive characteristics of a noise are likely to increase the scope for complaints and this is taken into account by adding +5 dB to the specific noise source level to obtain the 'Rating Level'. BS 4142:1997 requires that the Rating Level of a noise is compared with the existing background noise ($L_{A90,T}$). Guidance given in the standard states that if the difference between the Rating Level and the background noise ($L_{A90 T}$) is +5 dB, it would be considered as being of 'marginal significance'. This is usually taken as being an acceptable situation, as it is a reasonable compromise between the requirements of commerce and the amenity of residents. A difference of +10 dB indicates that complaints are likely. If the Rating Level is more than 10 dB below the background noise this is a positive indication that complaints are unlikely.

5.2 Noise Criteria

Acoustic Associates (Peterborough) usually recommend an Assessment Level (i.e. Rating Level – background noise level) of +5 dB as an appropriate criteria. However, local councils in London may require an Assessment Level criteria of -5 dB. This is therefore taken as the noise limit in this assessment.

5.3 Noise Measurements

Noise monitoring equipment was set up on the site on a fire exit stairwell at the north of the existing court yard (See Figure 1). This location is considered to be representative of the background noise at the location of all surrounding residences. Noise was continuously monitored throughout the period from 15:47 hours on Tuesday 29th Jan to 07:17 hours on Wednesday 30th Jan 2013. The noise monitoring location was in free field on the third floor level,

around 10 metres above the ground. Appendix 2 gives details of the noise instrumentation used.

5.4 Plant Information

At this stage of design it is anticipated that there will be refrigeration plant for the retail unit located in an external plant yard on the northern part of the building, as shown in Figure 1. The estimated combined noise level of this plant is 85 dB(A) at 1m ($L_{wA} = 96$ dB(A)). Acoustic enclosures will be installed if necessary.

The building may also require an additional AHU for the office space. At this stage of design, the AHU is proposed to be located on the roof of the existing building, as shown in Figure 1. The estimated noise level of this plant is 65 dB(A) at $1m (L_{wA} = 76 dB(A))$.

5.5 Computer Noise Model of the site and Surrounding Area

A computer noise model of the site and surrounding area was generated using Wolfel IMMI Computer Noise Modelling Software (Reference 3) which uses the methods given in ISO 9613 – 2 (Reference 2) to calculate noise levels given a topographical model of the site. A view of the model is shown in Figure 2. The plant was modelled as point noise sources, with sound power levels (L_{wA}) as estimated (see above). The exact location of the plant is not confirmed at this stage of design, so for the purposes of this assessment, the refrigeration plant noise source was positioned to the north of the new building, at 1 m above the ground and the AHU noise source was positioned on the roof of the existing building. Point noise sources are shown in Figure 2 as grey speaker symbols.

The computer model predicts the sound levels at locations around the site. The assessment locations are explained in the next section.

5.6 Assessment Locations

Reception points were created at eight locations, numbered:

- 1 GF closest flats to the East, ground floor level (1.5 m above the ground)
- 1 TF closest flats to the East, third floor level (7.5 m above the ground)
- 2 GF –flats to the North-East, ground floor level (1.5 m above the ground)
- 2 TF flats to the North-East, third floor level (7.5 m above the ground)
- 3 GF closest flats to the North, ground floor level (1.5 m above the ground)
- 3 TF closest flats to the North, third floor level (7.5 m above the ground)
- 4 FF closest flats to the West, first floor level (4.5 m above the ground)
- 4 FF closest flats to the West, third floor level (7.5 m above the ground)

All assessment locations were placed 1 m in front of the building façade. Assessment locations are marked with black and white circles in Figure 2.

5.7 Ratings Level Calculation

The predicted sound level of the plant was calculated at the assessment locations using the computer model. The Rating Level could then be determined using this 'specific noise level' and compared to the 'background noise level' to determine the Assessment Level – as described in section 5.1 of this report. The results are shown in section 6 of this report.

6 <u>RESULTS</u>

6.1 Measured Noise Levels

The noise levels measured at the site are shown in graphical form in Appendix 3. There was heavy rainfall during the early morning hours, from approximately 03:00 hours. The lowest background noise level, recorded at 01:17 hours, was **51 dB(A)** and this level was therefore selected for the assessment.

6.2 Assessment Level Calculation

The following table shows the calculation of the assessment level at each location. As the character of the noise is likely to attract attention (tonal hum), 5 dB is added to the Specific Noise Level to achieve the Rating Level. This is then compared with the background noise level to calculate the assessment level.

Assessment Locations	Specific Noise level L _{Aeq,T} dB(A)	Rating Level dB(A) L _{Ar,Tr} dB(A)	Background Noise Level (L _{A90} dB(A))	Assessment Level dB L _{Ar,Tr} - L _{A90}
1 GF	55.7	61	51	+10
1 TF	60.9	66	51	+15
2 GF	41.0	46	51	-5
2 TF	45.5	51	51	0
3 GF	60.4	65	51	+14
3 TF	66.2	71	51	+20
4 FF	68.0	73	51	+22
4 TF	70.1	75	51	+24

Table 1 – BS 4142 assessment level before mitigation

It can be seen that without mitigation, the assessment level is unacceptable at most locations. The noise levels are dominated by the noise from the proposed refrigeration plant on the ground floor external plan area.

6.3 Noise Mitigation

Table 2 shows the assessment levels with the refrigeration plant noise reduced by 29 dB(A), in order to achieve an acceptable noise impact. Section 3.2 of this report gives ways of controlling the noise levels.

Assessment Locations	Specific Noise level L _{Aeq,T} dB(A)	Rating Level dB(A) L _{Ar,Tr} dB(A)	Background Noise Level (L _{A90} dB(A))	Assessment Level dB L _{Ar,Tr} - L _{A90}
1 GF	28.7	34	51	-17
1 TF	32.7	38	51	-13
2 GF	23.1	28	51	-23
2 TF	25.8	31	51	-20
3 GF	31.7	37	51	-14
3 TF	37.4	42	51	-9
4 FF	39.1	44	51	-7
4 TF	41.1	46	51	-5

Table 2 – BS 4142 assessment level after mitigation

With the proposed refrigeration plant noise levels reduced, the Assessment Level is acceptable at each location. A computer model output showing noise contribution from each source is given in Appendix 4.

REFERENCES

- British Standard BS 4142 : 1997
 Rating industrial noise affecting mixed use residential and industrial sources
- ISO 9613 2:
 Acoustics Attenuation of sound during propagation outdoors.
- 3 Wolfel IMMI Computer Noise Modelling Software.

APPENDIX 1 – Glossary of Terms

Sound Pressure	The variation of ambient pressure that is detected by the ear as sound.
Noise	Unwanted sound
deciBel (dB)	Ten times the logarithm of the square of the ratio of the Sound Pressure to a reference pressure (20 micro-Pascal's).
Sound Pressure Level (Lp)	The decibel version of the Sound Pressure.
A-Weighting	A frequency weighting which simulates the response of the ear. An A-Weighted Sound Pressure Level is denoted by L_{pA} and has units of dB(A)
L _{Aeq,T}	The value of the A-weighted sound pressure level, in decibels [dB(A)], of a continuous steady sound that within a specified time interval (T), for example 16 hours, has the same mean-square sound pressure as a sound that varies with time. Therefore, the average over a 16 hour period would be denoted as $L_{Aeq,16h}$
L _{Amax,T}	The maximum A-Weighted sound pressure level that was encountered during the measurement period.
L _{A90,T}	The A-Weighted sound pressure level that is exceeded for 90% of the time (T). This is usually used a measure of background noise.
Free Field	Where noise can propagate freely without any reflections from buildings etc.
Octave Band	A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000
Tr	The reference time interval over which an equivalent continuous A- weighted sound pressure is determined. Day time = 1 hour Night-time = 5 minutes
Tm	The measurement time interval over which measurements are taken.
Ambient Noise	Total sound in a given situation at a given time.
Residual Noise	The ambient noise remaining at a given position in a given situation when the specific noise is suppressed to a degree such that it does not contribute to the ambient noise.
Specific Noise Level	The dB $L_{Aeq,Tr}$ of the noise sources being assessed at a site.
Insertion Loss	The difference in noise levels with, and without, a noise reducing device fitted
Rating Level L _{Ar,Tr}	The specific noise level plus any correction (+5 dB) for the character of the noise, known as the Rating Level.
Assessment Level	Difference between Rating Level $(L_{\mbox{\scriptsize Ar},T})$ and Background Noise $(L_{\mbox{\scriptsize A90,T}})$
Sound Power Loval (I)	The noise level from the source in terms of sound nower in $dB(A)$

APPENDIX 2 - Noise Instrumentation

Туре	Manufacturer	Manufacturer Description Serial number		Last Calibration Date	Calibration Certificate No.
SVAN 957	Svantek	Sound Level Meter	27517	22/02/2012	S120111
GA607	Castle	Sound Level Calibrator	043186	13/07/2012	043186/58000

The calibration of the noise meter was checked at the start and end of the tests and there was no significant drift.

Environmental Noise Assessment of the new Office and Retail Building at Fox Court, 14 Grays Inn Road, London

APPENDIX 3 - Results of Long-Term Noise Monitoring on Site

Weather: Average temperature 11°C, light Westerly wind. Heavy rain in the early morning hours, from approximately 3am.



APPENDIX 4 – Computer Model Output

Legend:

L $_{\rm r,i,A}-$ partial, A-weighted noise level

L_{r,A} – overall A-weighted noise level.

Mid-size list >	»	Point calculation	Point calculation						
Noise prediction									
IPkt001 »	1 GF	Variant 0 Setting:	Last direct entry						
		x = 100.17	m	y = 98.50 m	z = 1.50 m				
		Night							
		L r,i,A	L r,A						
		/dB	/dB						
EZQi001 »	Retail unit plant	26.695	26.695						
EZQi002 »	AHU	24.330	28.682						
	Sum		28.682						

IPkt002 »	1 TF	Variant 0 Setti	Variant 0 Setting: Last direct entry							
		x = 100	x = 100.17 m		y = 98.50 m		.50 m			
		Nig	Night							
		L r,i,A	L r,A							
		/dB	/dB							
EZQi001 »	Retail unit plant	31.922	31.922							
EZQi002 »	AHU	24.524	32.648							
	Sum		32.648							

IPkt003 »	2 GF	Variant 0 Setti	Variant 0 Setting: Last direct entry							
		x = 99	x = 99.64 m		7.20 m	z = 1.50 m				
		Nig	Night							
		L r,i,A	L r,A							
		/dB	/dB							
EZQi002 »	AHU	22.754	22.754							
EZQi001 »	Retail unit plant	11.909	23.098							
	Sum		23.098							

lPkt004 »	2 TF	Variant 0 Setting	Variant 0 Setting: Last direct entry						
		x = 99.64	x = 99.64 m		z = 7.50 m				
		Night	:						
		L r,i,A	L r,A						
		/dB	/dB						
EZQi002 »	AHU	25.279	25.279						
EZQi001 »	Retail unit plant	16.445	25.813						
	Sum		25.813						

IPkt007 »	3 GF	Variant 0 Settir	Variant 0 Setting: Last direct entry							
		x = 75.	x = 75.88 m		I.43 m	z = 1.50 m				
		Nig	Night							
			L r,i,A	L r,A						
		/dB	/dB							
EZQi001 »	Retail unit plant	31.347	31.347							
EZQi002 »	AHU	20.164	31.666							
	Sum		31.666							

Environmental Noise Assessment of the new Office and Retail Building at Fox Court, 14 Grays Inn Road, London

IPkt008 »	3 TF	Variant 0 Setting: Last direct entry						
		x = 75.88 m		y = 91	y = 91.43 m		.50 m	
		Ni	ght					
		L r,i,A	L r,A					
		/dB	/dB					
EZQi001 »	Retail unit plant	37.178	37.178					
EZQi002 »	AHU	23.175 37.348						
	Sum		37.348					
IPkt005 »	4 FF	Variant 0 Setti	ng: Last direct en	try				
		x = 59).30 m	y = 76.72 m		z = 4	.50 m	
		Nig	ght					
		L r,i,A	L r,A					
		/dB	/dB					
EZQi001 »	Retail unit plant	39.020	39.020					
EZQi002 »	AHU	19.586	39.069					
	Sum		39.069					

IPkt006 »	4 TF	Variant 0 Setting	Variant 0 Setting: Last direct entry							
		x = 59.3	0 m	y = 76	y = 76.72 m		.50 m			
		Night								
		L r,i,A	L r,A							
		/dB	/dB							
EZQi001 »	Retail unit plant	41.067	41.067							
EZQi002 »	AHU	22.124	41.122							
	Sum		41.122							

FIGURE 1 – Location Plan of the Site



FIGURE 2 – Computer Model View





Company: Handled by: Project: Acoustic Associates Jaroslaw Gil Fox Court