BRAIDEN ACOUSTICS LTD

Innovation Forum // 51 Frederick Road // Salford // Manchester // M6 6FP

ACOUSTIC SURVEY FOR PLANNING

Client : Emma Fox

Date : 15 Dec 2016

Site : The Southpoint, 12 Lane End Road, Burnage, Manchester M19 1TU

Report No. : 10490revA

1 INTRODUCTION

Braiden Acoustics has been commissioned by Emma Fox to undertake an acoustic survey at the site of The Southpoint, 12 Lane End Road, Burnage, Manchester M19 1TU in order to support a planning application for the change of use from shop unit and hairdresser (Class A1) to a children's day nursery (Class D1).

Condition 7 and 8 both relate to noise:

> *7) Before any use hereby approved commences, the premises shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning authority.*
>
> *Reason - To safeguard the amenities of the occupiers of the building and occupiers of nearby properties, pursuant to policies SP1 and DM1 of the Core Strategy.*
>
> *8) Before first occupation of the development the building, together with any externally mounted ancillary equipment, shall be acoustically insulated in accordance with a scheme submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the equipment.*
>
> *Reason - To safeguard the amenities of the occupiers of nearby residential accommodation, pursuant to policies SP1 and DM1 of the Core Strategy..*

1.1 AIM

This report assesses potential noise impact on the nearby residents and recommends any mitigation acoustic measures so that the Council's noise thresholds are met so the above Conditions can be discharged.

2 DESCRIPTION OF SITE

The site is on the ground floor of mixed use development called The Southpoint in Burnage, on the corner of Burnage Lane and Lane End Road.



Figure 1
Street view of site

The site is in predominantly residential area although there are a number of commercial uses nearby; not least, a large Tesco directly to the east. The A34 Kingsway, an arterial route into Manchester is some 150m to the west with Burnage railway station approximately 350m to the west.



Figure 2
Site location and surrounding uses

2.1 EXISTING USE

The ground floor unit was originally two separate A1 uses.

2.2 PROPOSED USE

The nursery will cater for a maximum of 40 children aged between 0 ---5 years, 19 Children full time, 11 children part time (morning and afternoon sessions) and 10 term time only.

There will be 4 full time staff and 2 part time staff in total.

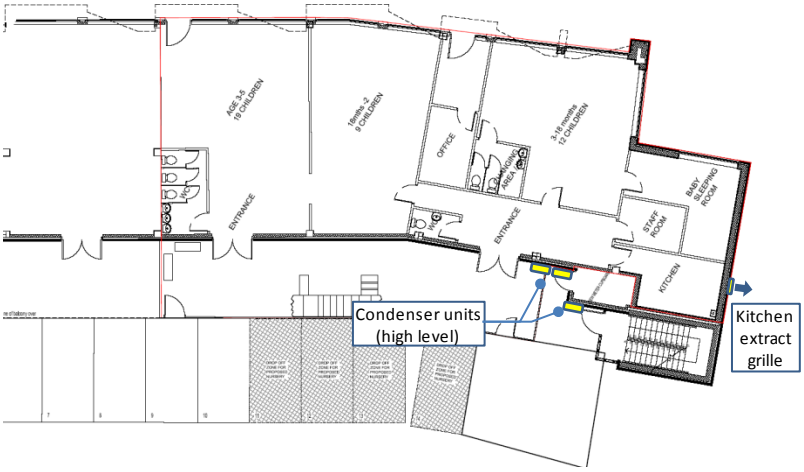

Figure 3
Proposed Internal layout

2.2.1 Party floor construction

Concrete floors with suspending ceiling with absorptive ceiling tiles - Armstrong Tatra ceiling tiles which are a Class D absorber with alpha_w = 0.55.

2.2.2 Mechanical services

There are to be the following mechanical services:

- kitchen extract hood and fan – IKEA LUFTIG (72 dBA sound power level)
- Air Conditioning outdoor units
    - ASH-12AIE2 (53 dBA @ 1m[1])
    - ASH-24AIE2 (55 dBA @ 1m)
    - ASH-18AIE2 (58 dBA @ 1m)

Noise levels for the above units were only available in single figure data.

2.2.3 Opening Hours

Monday to Friday 07.00 - 19.00

3 ACOUSTIC CRITERIA AND METHODOLOGY

3.1 BS 4142

BS 4142:1999 "Method for rating industrial noise affecting mixed residential and industrial areas" [1] assesses industrial noise with regards to nearby residential dwellings. The guidance is commonly used to compare the equivalent noise from an industrial source only (*specific noise level*), L_{Aeq}, to the background noise level, L_{A90}, at the nearest sensitive receptor (NSR).

This Standard has been recently updated, BS 4142:2014 "Methods for rating and assessing industrial and commercial sound" [2]. Whereas the old standard added 5dB 'penalty' to the Specific Noise Level (SNL) if the noise source has a 'character' that can draw attention that may be described as tonal, intermittent or impulsive, the new standard gives clearer guidance on noise 'character'. Furthermore, the previous

[1] Noise measurements were made in a semi anechoic chamber so it is assumed that were made at a distance of one metre.

Standard gave only one 5 dB penalty whereas the new Standard may not. When added to the specific noise level it forms the *rating level*. The new Standard gives the guidance for the following types of noise character:

> *Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.*
>
> *Correct the specific sound level if a tone, impulse or other characteristic occurs, or is expected to be present, for new or modified sound sources.*
>
> *NOTE 1 The prominence of tonal or impulsive sound from a source can be masked by residual sound. In many cases the amount of masking varies as the residual sound changes in level and possibly character. The source's tonal and/or impulsive characteristics could also vary with time.*
>
> *Consider the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention.*
>
> *Tonality*
>
> *For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.*
>
> *Impulsivity*
>
> *A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.*
>
> *Other sound characteristics*
>
> *Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*
>
> *NOTE 2 Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.*
>
> *Intermittency*
>
> *When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*

Once a penalty for noise character is added to the Specific Noise Level then this is termed the *Rating Level*.

The background level is then compared to the rating level. It is usual that the rating level due to the source should be below the background noise level at the nearest sensitive receptor; indeed BS 4142 states:

> *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

3.1.1 Council criteria for BS 4142

It is usual for Council's to recommend that the Rating Level from mechanical services is 5 dB below the background at the nearest resident.

3.2 BS 8233: 2014

The British Standard BS 8233:2014 "Guidance on sound insulation and noise reduction for buildings" gives guidance on recommended indoor ambient noise levels for residential dwellings.

Room	Criterion	$L_{Aeq,T}$	
		night	day
Bedroom	Sleeping	30	35
Dining Room/Area	Dining	--	40
Living Room	Resting	--	35

Table 1
Recommending indoor ambient noise level thresholds from anonymous noise (taken from Table 4, BS 8233:2014)

Internal levels are simply predicted by the subtraction of the estimated sound reduction index (SRI) of the building façade from the external free field noise measurements. When considering the SRI of a particular façade it is usual to only consider the glazing as this is the weakest element acoustically.

4 Monitoring Details

As part of the acoustic assessment of the proposed take away, the following noise measurements have been undertaken:

1. sound insulation measurement between the ground floor unit and the residential apartment at first floor,
2. external ambient noise measurements,
3. typical internal noise levels,
4. in-situ sound pressure level measurement of the external plant.

4.1 Overview

Personnel: John Braiden, BSc & MSc Acoustics, MIOA.

Equipment: NTi XL2 integrated real time analyser & B&K 4231 calibrator.

4.2 Sound insulation test

A sound insulation test of the separating floor was taken according to relevant Standards and Guidance. The result from the sound insulation test is (full details available on request):

57 dB $D_{nT,w}$.

4.3 External noise monitoring details

External ambient noise measurements were made from the front balcony of the first floor flat above the nursery.

Weather: 14-18°C temperature; ~5ms^{-1} wind; ~60-80% cloud;

Location: microphone approx 1 m from front window on the first floor on the balcony

The sound level meter was calibrated before after the measurements with no significant drift reported.

Monitoring was unmanned with audio recorded.

4.3.1 Monitoring results

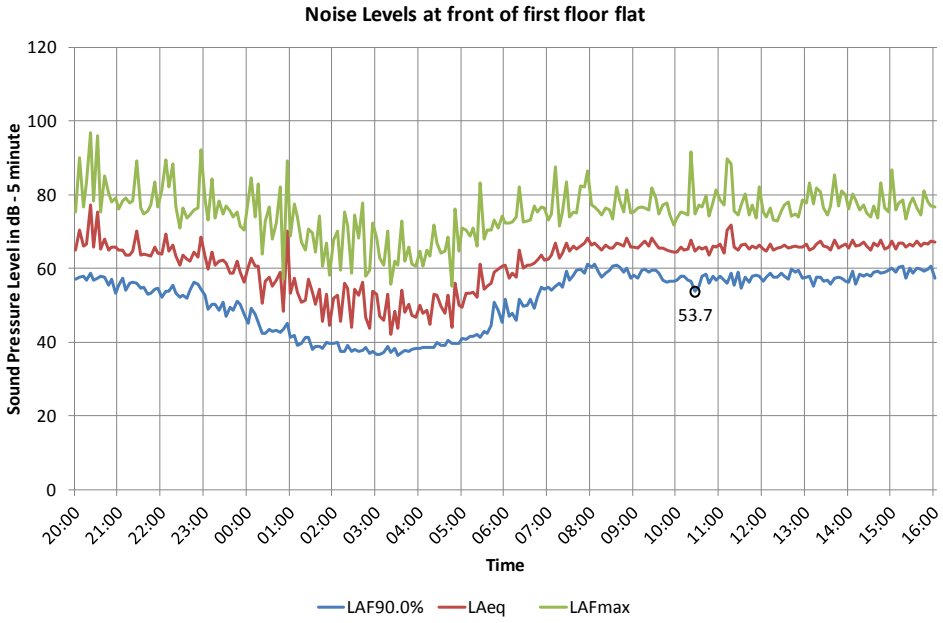

Figure 4
Time history

The lowest background noise level, during proposed opening hours, was 53.7 dB(A).

Ambient noise was predominantly road traffic noise.

4.4 IN SITU FAN NOISE

There is only a small domestic kitchen extractor fan with a 100mm^2 grille. However it was not possible to measure the noise from the grille due to its relatively low noise level compared to the residual noise level[2].

[2] Residual Noise Level is the ambient noise level without the noise source operating.

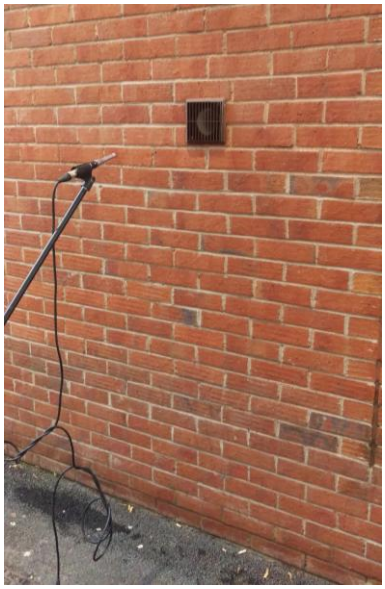

Figure 5
Attempt to measure noise from kitchen extract grille

The very small domestic grille can be seen from Figure 5.

4.5 INTERNAL NOISE FROM CHILDREN

As part of the assessment, some historic data has been used to indicative values of typical noise levels from nursery type uses.

Time Period, *T*	Activity	Noise descriptor	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)
15:05 – 15:25	Singing **indoors** (10 children and 2 carers)	Small CD player at low and bass-light level, carers and children singing loudly with tapping and shaking musical instruments	75	95
11:08 – 11:31	Free play **indoors** (10 children and 3 carers)	Children crying and screaming whilst playing on toys such as tapping and shaking with carers making loud noises as entertainment	74	94

Table 2
Typical nursery noise measurements

As a worst case, the higher equivalent noise of 75 dB L_{Aeq} shall be used.

4.6 CONDENSER NOISE

Noise measurements were made of the three condenser units approximately 2.5 metres. The flat above has no direct line of sight to the condensers due to the balcony; therefore, there is a significant barrier effect.

Further noise measurements were made 1.5 metres from the rear elevation of flat 15.

Location	Time		Duration T	L_{A90} dB	L_{Aeq} dB	L_{Amax} dB
	Start	Finish				
Ground Floor 2m from condensers	14:20:00	14:25:00	00:05:00	60.6	62.2	82.2
First Floor Flat 15 – conds on	14:30:40	14:34:28	00:03:48	55.6	56.8	69.8
First Floor Flat 15 – conds off	14:41:54	14:45:00	00:03:06	56.1	57.9	69.3

Table 3
Summary of condenser noise measurements

5 ACOUSTIC ASSESSMENT

5.1 NOISE BREAK OUT

5.1.1 Nursery noise via party floor

Daytime noise level in habitable rooms should be no higher than 35 dB L_{Aeq} – as specified in Table 1. Noise levels in the nursery will have an equivalent level of 75 dB(A). This then gives a target sound insulation for the party floor to be 40 dB or higher.

The sound insulation measurement of the floor gives a rating of 57 dB $D_{nT,w}$ which is 17 dB over the minimum required. Therefore, no extra sound insulation is required for the floor / ceiling.

5.1.2 Nursery noise via glazing

The windows to the front are assumed to be standard double glazed units that give a sound reduction index of 30 dB R_w. There is 2m between the windows to the front of the ground floor to the windows on the first floor. Furthermore, the balcony at first floor level acts as a barrier, so assuming grazing incidence, a 5dB reduction can be applied. .

BS 4142 Noise Break Out Assessment	Value	*Calculation*	dB
Noise Level of children internally L_{Aeq}			75
Glazing Attenuation (closed)			-30
Distance Attenuation	2	20*log(2)	-6
Barrier effect			-5
BS 4141			
Tonality	0		0
Impulsivity			+3
Intermittency			+3
Rating Level			**40**
Background Noise Level			57
Rating minus Background			**-17**

Table 4
BS4142 assessment of noise break out

The Specific Noise Level from noise break out via the glazing has been predicted to be 17 dB below the lowest daytime Background Noise Level and so well within Council guidelines.

5.2 EXTERNAL PLANT NOISE

5.2.1 Kitchen extract fan noise

Noise from the small domestic kitchen ventilation system is negligible; not to mention the large distance from grille to habitable room and the significant barrier effect. Therefore, noise from the ventilation will be inaudible an undetectable at the nearest habitable window and so will not be an issue.

5.2.2 Condenser noise

Noise levels were measured outside Flat 15 with all three condenser units operating and not operating. Table 3 shows that for each acoustic metric (L_{A90}, L_{Aeq} and L_{Amax}) there is less than one decibel difference – in effect, there is no change in noise level at the nearest resident with the condensers on and off. Therefore, it is clear that noise from the condensers has not affect on the ambient noise levels at the nearest habitable dwelling and so must be at least 5 dB below the background noise. It was also noted that the noise from the condensers was inaudible at Flat 15. This was due to both the distance separation and significant barrier effect caused by the intervening balcony.

6 CONCLUSION

An acoustic survey has taken place at the The Southpoint, 12 Lane End Road, Burnage, Manchester M19 1TU to support a planning application for the change of use to a nursery.

A summary of the assessment is as follows:

- There is sufficient sound insulation between the ground and first floor; therefore no further mitigation required.



- Noise break out via the front glazing is 17 dB below the background at the first floor flat; hence no further mitigation required.
- The kitchen extractor fan noise is inaudible and undetectable at the nearest resident; no further mitigation required.
- Noise from the condenser units is also inaudible at the nearest resident; no further mitigation required.

In conclusion, the current noise sources have all been designed and implemented in such a way that there is no noise detected at the nearest resident and therefore the amenity of the proposed residents will be safeguarded against noise and the noise conditions can be discharged.

7 REFERENCES

[1] BS 4142: 1997
Method for Rating industrial noise affecting mixed residential and industrial areas
British Standards Institute, 1997.

[2] BS 4142: 2014
Methods for rating and assessing industrial and commercial sound
British Standards Institute, 2014.

Appendix

A1 PLANT DATA

A1.1 Outdoor units

MODEL			ASH-09AIE2	ASH-12AIE2	ASH-18AIE2	ASH-24AIE2
Capacity cooling / heating	kW		2,6 (0,5-3,2) / 2,8 (0,5-4,1)	3,5 (0,6-4,0) / 3,8 (0,6-5,1)	5,3 (1,2-6,2) / 5,6 (1,1-6,0)	6,5 (2,5-6,6) / 7,0 (2,5-7,6)
Power supply	Hz / V		1~ / 50 / 220-240	1~ / 50 / 220-240	1~ / 50 / 220-240	1~ / 50 / 220-240
	Unit		Outdoor	Outdoor	Outdoor	Outdoor
Power input cooling / heating	W		870 / 900	1150 / 1100	1675 / 1750	2180 / 2220
Rated power input cooling / heating	W		1550	1650	2650	2800
Power current cooling / heating	A		3,8 / 4,0	5,1 / 4,9	7,4 / 7,8	9,7 / 10,5
Rated power current cooling / heating	A		6,9	7,3	11,8	12,5
SEER / SCOP	-		5,6 / 4,0	5,6 / 4,0	5,6 / 4,0	5,6 / 4,0
Energy class	-		A+ / A+	A+ / A+	A+ / A+	A+ / A+
Air flow	ID	m^3/h	600/ 520/ 370/ 280	680/ 560/ 410/ 300	800/ 680/ 560/ 460	1000/ 800/ 700/ 550
	OD	m^3/h	1600	1600	3200	4000
Sound pressure level	ID	dB(A)	41/ 38/ 30/ 24	42/ 39/ 31/ 25	49 / 44 /40 /35	51/ 47/ 42/ 39
	OD	dB(A)	51	53	55	58
Dehumidifying volume	l/h		0,8	1,4	1,8	2,1
Refrigerant type / charge	Type / kg / t eq.CO_2		R410A / 0,70 / 1,46	R410A / 0,85 / 1,77	R410A / 1,30 / 2,71	R410A / 1,80 / 3,76
Pipe diameter	Liquid side	inch / mm	¼ / 6,4	¼ / 6,4	¼ / 6,4	¼ / 6,4
	Gas side	inch / mm	⅜ / 9,5	⅜ / 9,5	½ / 12,7	⅝ / 15,9
Standard pipe length	m		5	5	5	5
Max. pipe length	m		15	20	25	25
Max. elevation / Drop height	m		10	10	10	10
Additional refrigerant	g/m		20	20	20	50
Dimension (w x h x d)	ID	mm	770x283x201	770x283x201	865x305x215	1007x315x219
	OD	mm	776x540x320	776x540x320	963x700x396	1000x790x427
Package dimension (w x h x d)	ID	mm	847x345x276	847x345x276	948x383x310	1076x398x328
	OD	mm	851x595x363	851x595x363	1029x750x458	1083x855x488
Net/gross weight	ID	kg	8,0 / 9,5	9,0 / 10,5	12,0 / 15,0	14,0 / 17,0
	OD	kg	28,0 / 31,0	29,0 / 32,0	46,0 / 50,5	55,5 / 60,5
Set temperature range	℃		16~30	16~30	16~30	16~30
Operating temperature range	Cooling	℃	-15~43	-15~43	-15~43	-15~43
	Heating	℃	-20~24	-20~24	-20~24	-20~24

The specification of products is subject to change based on further development of the units by the producer and can be changed without prior notice. Refer to rating label. Data are based on following conditions:
Length of connection pipe: 5m. Cooling: indoor temperature 27℃ DB/19℃ WB, outdoor temperature 35℃ DB/24℃ WB. Heating condition: indoor temperature 20℃ DB/15℃ WB, outdoor temperature 7℃ DB/6℃ WB.
SEER/SCOP was calculated according to European standards contained in EN14825 for average season, based on part load classifying and testing conditions given by norm EN14511. Contains fluorinated greenhouse gases covered by the Kyoto Protocol. R410A (50% HFC-32, 50% HFC-125), GWP of refrigerant used: 2088. Noise is tested in the semi-anechoic room, so it should be slightly higher in the actual Operation due to environmental change. Power input is tested under standard condition.

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ENGLISH **10**

Technical Data

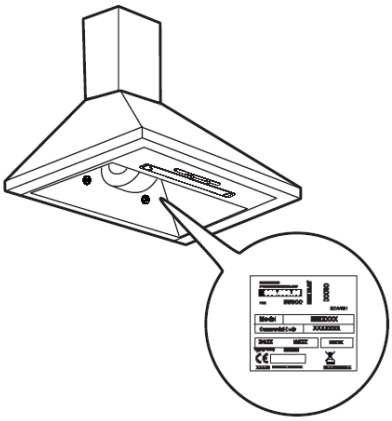
		Unit	Value
Product Type			Wall mounted hood
Dimension	Width	mm	598
	Depth	mm	471
	Height min/max	mm	620/995
Airflow max* - Exhaust		m3/h	400
Noise max* - Exhaust		dBA	64
Airflow max* - Recirculating		m3/h	270
Noise max* - Recirculating		dBA	72
Total Power		W	161
Lamps info			Halogen Bulb
			2 x 28W
			E14
Installation minimum height - gas hob		mm	650
Installation minimum height - elec hob		mm	500
Net Weight		Kg	6,4

* Maximum speed (boost excluded)

CE

This appliance has been designed, manufactured and marketed in compliance with the E.E.C. Directives.

The technical information is situated in the rating plate on the internal side of the appliance.



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