



BRAIDEN ACOUSTICS LTD

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RESIDENTIAL ACOUSTIC SURVEY

Prepared for: P Casey & Co Ltd

Date : 16 Nov 2021

Site : Brown Street, Littleborough

Report No. : 10947revA

1 INTRODUCTION

Braiden Acoustics has been commissioned by P Casey & Co Ltd to undertake a noise assessment survey at the site of Brown Street, Littleborough in order to support a planning application for a change of use to a residential development of apartment blocks.

This is an updated report from the original Braiden Acoustics report number 10793, dated 6th April 2021 with a revised scheme.

1.1 AIM

This report shall define the site and its neighbours. The potential noise sources shall be assessed according to council guidelines with mitigation measures recommended where and if necessary, so that the relevant guidelines and standard are adhered to, regarding noise.

2 DESCRIPTION OF SITE

The site is currently a variety of light industrial and individual storage units.

2.1 SITE LOCATION AND NEIGHBOURING USES

The proposed site is shown outlined in red in Figure 1 and is bounded by Brown Street to the east, partially by Wood Street to the south and a public footpath to the west, leading out to a green space to the north. On the other side of the footpath is large food manufacturer, McCormick Europe, which specialise in spices, seasonings and flavourings.

To the south west, outlined in brown in Figure 1, is a vehicle repair garage called Breda Garage. Elsewhere there are existing residential dwellings.

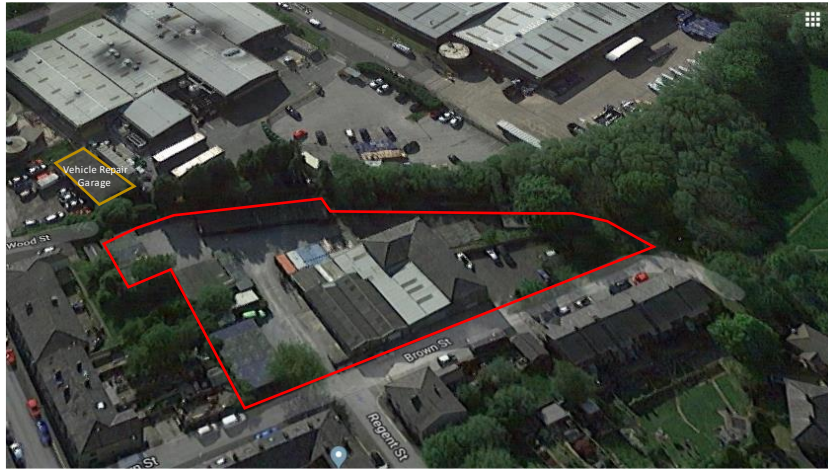


Figure 1
Site edge red and surrounding uses

2.2 PROPOSED USE

The proposal is for a four storey apartment block with the following dwelling schedule:

31No 2-bed @ 51.80m²

09No 1-bed @ 42.50m²

Total 40No units

The proposed layout is for the residential dwelling on the western flank and car parking on the eastern flank of the site – as shown in Figure 2.



Figure 2
Proposed site layout



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 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.”

3.2 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)

The Standard also gives upper limits for internal ambient noise levels within unoccupied non-residential uses.

Activity	Location	Design range dB $L_{Aeq,T}$
Speech or telephone communications	Department store	50 – 55
	Cafeteria, canteen, kitchen	
	Concourse	45 – 55
Study and work requiring concentration	Corridor, circulation space	40 – 50
	Library, gallery, museum	
	Staff/meeting room, training room	
Listening	Executive office	35 – 40
	Place of worship, counselling, meditation, relaxation	30 – 35

Table 2

Typical noise levels in non-domestic buildings

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.

3.3 COUNCIL CRITERIA

The council’s criteria regarding noise assessments were not known at the time of writing so typical guidance will be used.

3.3.1 Residential Developments

Noise levels within habitable spaces is taken from BS 8233 :



- **Bedrooms**
 - **30 dB LAeq (night time - 23.00 - 07.00)**
 - **45 dB L_{Amax,F} (individual noise events should not normally exceed by more than 15 times)**
- **Living Rooms (daytime - 07.00 - 23.00) 35 dB LAeq**
- **Gardens and terraces (daytime - 07.00 - 23.00) 55 dB LAeq**

3.3.2 Noise and Vibration from Fixed Plant / Equipment

Noise threshold for external plant is taken from BS 4142 with a typical criterion as follows:

Any noise assessment needs to consider not only the overall level of noise emitted but also its particular characteristics. The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that:

‘Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location’.

By designing the sound pressure level of any plant items to generate a noise impact of at least 5dB below the existing background level, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages.

4 NOISE MEASUREMENT DETAILS

External background noise measurements have been taken at the western boundary adjacent to McCormick Europe food processing plant and Breda vehicle repair garage.

4.1 EXTERNAL AMBIENT NOISE

In order to assess the noise levels from the plant, daytime and night time ambient background noise levels have been taken.

For measuring background noise levels, BS 414 states:

“Ensure that the measurement time interval is sufficient to obtain a representative value of the background noise level.”

15 minute L_{A90} intervals were logged both for the night and day time as a worst case.

In addition, day and night time L_{Aeq} levels were measured for the BS 8233 assessment.

4.1.1 Monitoring details

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

Weather: 6 - 12° C; <5ms⁻¹ wind; ~40-60-% cloud; some light precipitation.

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

Date: Wednesday 1st April 2020

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

Monitoring was unmanned.



4.1.2 Monitoring results

During the monitoring there was regular birdsong due to the surrounding trees and foliage.

There was also noise from the proposed site with people accessing storage units, so there was noise associated with opening and closing heavy storage doors, engines idling, chatter and footsteps on the gravel.

Another spurious noise source was wind noise – all the above noise sources were not relevant and therefore excluded.

The main issue of noise, especially at night, is from the food manufacturer. Such noise sources included:

- vehicle movements
- starting / idling engines
- pallet truck movements
- doors slamming
- external plant – constant low level drone
 - more tonal plant switched on 17:24 -19:42
 - 01:17 – 04:44
- reverse sirens
- bangs, clangs, clicks etc. from various site movements
- dumping of rubbish.

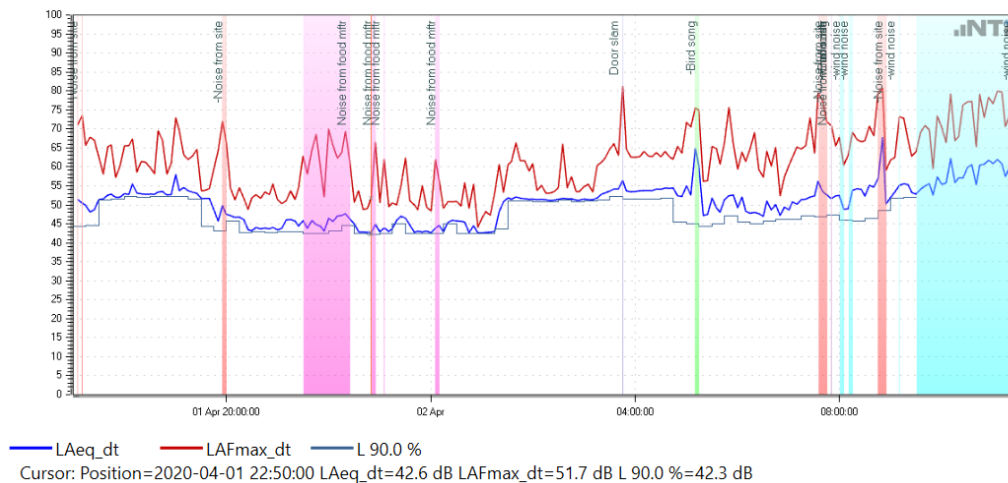


Figure 3
Time history noise data

A typical noise event used for the BS 4142 assessment is as follows:

at 01:35

- various plant noise
- impulsive noises
- reverse sirens



- loading / unloading lorry

54 dB L_{Aeq} .

The lowest background noise level was 42.3 dB L_{Aeq} at 22:50.

The day and night time levels are shown in Figure 4. From the equivalent day and night time noise levels it is clear that the overall noise level remains, more or less, the same throughout a 24 hours period due to operations and the food manufacturer, which operates 24 hours.

Date	Time		Duration	Time Period	L_{A90} dB	L_{Aeq} dB	L_{Amax} dB
	Start	Finish					
Wed 01/04/2020	17:02:22	23:00:00	05:51:11	day	42.8	50.2	72.9
	23:00:00	07:00:00	08:00:00	night	42.8	50.8	81.2
	07:00:00	11:21:15	02:05:55	day	46.8	52.7	73.2

Figure 4
Noise monitoring summary

Daytime noise 51 dB L_{Aeq}

Night time noise 51 dB L_{Aeq}

5 ACOUSTIC ASSESSMENT

The overall day and night-time noise levels will be assessed as well as the industrial noise from the adjacent food manufacturer.

5.1 BS 4142 ASSESSMENT - EXTERNAL PLANT NOISE

A typical noise event at 01:35 used for the BS 4142 assessment is as follows:

- various plant noise
- loading / unloading lorry.

54 dB L_{Aeq} .

The typical night time background noise level was 43 dB L_{Aeq} as the histogram below shows:

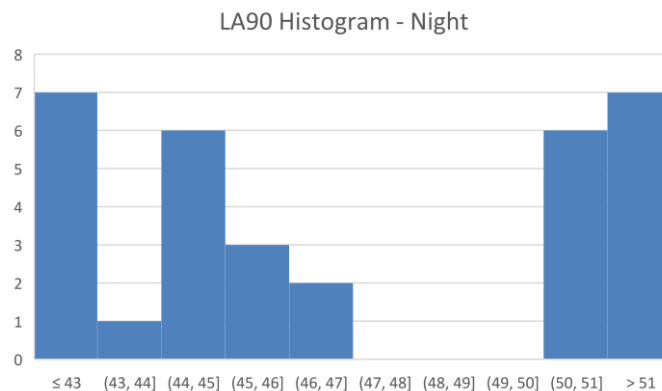


Figure 5
Histogram of night time background noise levels



BS 4142 Assessment Food Mcr	dB
Total noise level @ window	54
BS 4141	
Tonality	2
Impulsivity	0
Intermittency	3
Rating Level	59
Background Noise Level	43
Rating minus Background	+16

Table 3
BS 4142 assessment for food processing plant

Section 11 b) from BS 4142:2014 states:

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

Due to the excessive Rating Level compared to the Background Level, of +16dB, at the rear elevation, there will need to be mitigation measures. Therefore, there should be an addition increase of sound insulation of the windows on the rear elevation as well as the use of mechanical ventilation to obviate the need to open windows for rapid cooling.

A typical whole house ventilation system is shown in Figure 6 below.

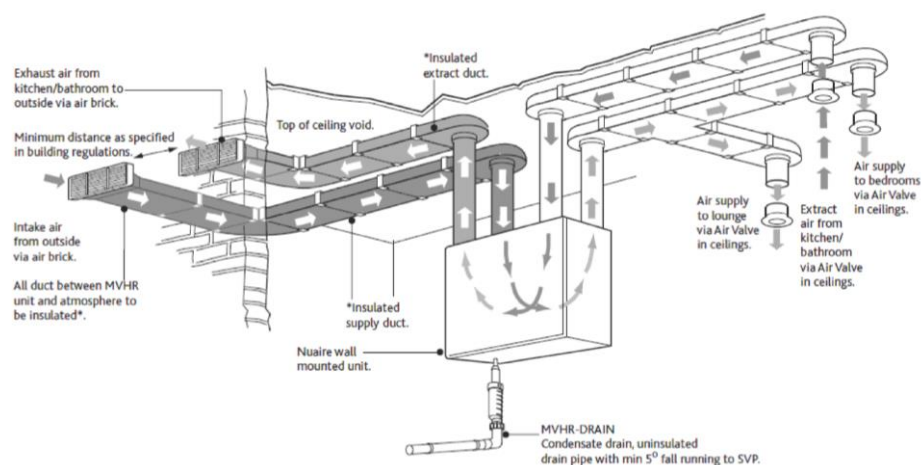


Figure 6
Typical whole house ventilation system layout

No such system has been yet defined for the site.

5.2 BS 8233 – INTERNAL NOISE LEVELS

The recommendation in the last section was that there should be no habitable rooms with direct line of sight to the food processing plant.

The basic required internal noise levels are given in Section and the amount of attenuation from the building façades were readily computed using the simple method in Appendix G of BS 8233:2014 whereby



the sound insulation index (SRI) of the glazing (the weakest element of the building façade, acoustically) is determined by simply deducting the required internal noise level from the external free field noise level¹.

A -3dB façade correction was necessary as the noise monitoring was at the façade and not free field.

No distance attenuation is required as noise monitoring was at or near the façade.

There is no barrier correction due to direct line of sight to the food manufacturer.

The same mitigation is given for all elevations.

Hence, the day and night levels used for the assessment are:

⇒ day time (07.00-23.00) L_{Aeq} is 51 dB(A)

⇒ night time (23.00-07.00) L_{Aeq} is 51 dB(A)

The weakest structural element is the glazing. The required glazing was calculated using recommended internal values and the external façade noise levels above. The Table below shows the required Sound Reduction Indices (SRI) for the bedrooms (night) and living areas (day) on each relevant elevation.

Façade	period	room	External Levels measured / calc'd		Internal Levels recommended		Required glazing	
			L_{Aeq} (dB)	L_{Amax} (dB)	L_{Aeq} (dB)	L_{Amax} (dB)	SRI ($R_w + C_{tr}$)	Example Spec
Rear	night	bedroom	67 ²		30		37	10 mm / 16 mm argon / 8.8 mm Pilkington Optiphon™
	day	lounge	67		35		32	10(6-20)/6
All	night	bedroom	51	--	30	--	21	4/(6-20)/4
	day	lounge	51	--	35	--	16	4/(6-20)/4

Table 4
Calculated SRI values and recommended glazing

Habitable rooms with direct or partial line of sight to the food processing plant require upgraded glazing as recommended in Table 4 above.

For all other elevations, standard glazing of 4/(6-20)/4 with a sound reduction of 25 dB $R_w + C_{tr}$ will suffice.

6 CONCLUSION

An acoustic survey has taken place at Brown Street, Littleborough to show the proposed residential site within context of its neighbours.

The main issue of noise is various industrial noises from the adjacent food processing plant to the west of the site. Therefore, the following recommendations are:

- upgraded glazing (as per Table 4) for all habitable rooms with direct or partial line of sight to the food processing plant.

¹ When the measured levels are façade levels, then 3dB is deducted to obtain the free field levels.

² +16 dB added due to BS 4142 assessment



- Mechanical ventilation scheme required for all habitable rooms with direct or partial line of sight to the food processing plant.

There are no other noise issues affecting the rest of the site and standard glazing is sufficient.

Pending the above recommendations, the relevant noise thresholds have been met.

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 GLAZING SPECS

Sound insulation data for Pilkington Optiphon™

Glass	Sound reduction index (dB)									
	Octaveband Centre Frequency (Hz)						R _w (C; C _r)	R _w	R _w + C	R _w + C _r
	125	250	500	1000	2000	4000				
Single glazing										
6.8 mm Pilkington Optiphon™	22	26	31	37	40	40	36 (-1; -4)	36	35	32
8.8 mm Pilkington Optiphon™	27	29	34	38	40	43	37 (0; -2)	37	37	35
10.8 mm Pilkington Optiphon™	26	30	35	39	40	46	38 (-1; -3)	38	37	35
12.8 mm Pilkington Optiphon™	29	32	36	41	42	51	40 (-1; -3)	40	39	37
16.8 mm Pilkington Optiphon™	31	33	38	41	43	54	41 (-1; -3)	41	40	38
Insulating glass units										
6 mm / 16 mm argon / 6.8 mm Pilkington Optiphon™	21	28	37	48	48	54	40 (-2; -6)	40	38	34
6 mm / 16 mm argon / 8.8 mm Pilkington Optiphon™	25	27	38	48	47	55	41 (-2; -6)	41	39	35
8 mm / 16 mm argon / 8.8 mm Pilkington Optiphon™	21	30	39	47	50	55	42 (-3; -8)	42	39	34
10 mm / 16 mm argon / 8.8 mm Pilkington Optiphon™	28	31	42	45	50	58	44 (-2; -6)	44	42	38
10 mm / 20 mm argon / 8.8 mm Pilkington Optiphon™	28	36	43	47	49	58	46 (-2; -6)	46	44	40
8.8 mm Pilkington Optiphon™ / 16 mm argon / 12.8 mm Pilkington Optiphon™	28	36	45	53	56	64	48 (-2; -7)	48	46	41
10.8 mm Pilkington Optiphon™ / 24 mm argon / 16.8 mm Pilkington Optiphon™	35	41	48	53	55	65	52 (-2; -6)	52	50	46
12.8 mm Pilkington Optiphon™ / 20 mm argon / 16.8 mm Pilkington Optiphon™	35	45	49	50	54	65	51 (-1; -4)	51	50	47

Measurements undertaken in accordance with BS EN ISO 10140 and R_w (C; C_r) determined in accordance with BS EN ISO 717-1.

For insulating glass units, there is little difference in the sound insulation for cavity widths in the range 6 to 16 mm.

To calculate performance data for Pilkington products, please use our Spectrum online calculator at <https://spectrum.pilkington.com/>

For glass combinations to achieve an R_w value higher than 52 dB, please contact us for more details.

