BRAIDEN ACOUSTICS LTD

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

NOISE IMPACT ASSESSMENT (RESIDENTIAL)

Prepared For :	MB Architectural Services Ltd	Date :	13 Aug 2024
Site :	Vanilla 39-41 Richmond St, Manchester	Report No. :	11316

1 INTRODUCTION

Braiden Acoustics has been commissioned by MB Architectural Services Ltd to undertake an acoustic survey at the site of Vanilla 39-41 Richmond St, Manchester to support a planning application which proposes to refurbish and extend upwards the existing building and realise 2no. 4-storey town houses.

1.1 AIM

This report shall investigate all pertinent noise sources that may affect the proposed residential use and propose any mitigation, where necessary, so that noise levels are within relevant guidelines.

2 DESCRIPTION OF SITE

The application property is a 2-storey unit on Richmond Street in Manchester, as shown in the figure below.

Figure 1
Street view of site

2.1 SITE LOCATION AND SURROUNDING USES

The site is within The Village area of Manchester town centre and is bounded by Richmond Street to the north west. Directly to the south west are 4no. town houses (43-49 Richmond Street) with Albert Jones Textiles Ltd beyond (51-53 Richmond St.). Directly to the north east is a small area of hardstanding that is used as a two-space car park . To the rear (south east) is a narrow alleyway followed by La Ville hotel (34 – 42 Canal St.) and McTucky's take away at 40 Sackville Street. On the opposite side of Richmond Street is a newly built residential site with 7no. town houses (40 Richmond Street) with a retail unit on the corner of Richmond Street and Sackville Street (38 Sackville St.).

Figure 2
Site location and surrounding uses

2.2 EXISTING USE

The building currently / has operates / operated as a night club.

2.3 PROPOSED USE

It is proposed to redevelop and reinstate the first two floors and then add another two floors to create 2no. four-storey town houses, with the top floor enjoying a roof terrace / balcony.

Figure 3
Proposed floor plans

As much as the original building is to be retained; for example, the first-floor window cills, which can be seen in Figure 1 and Figure 4.

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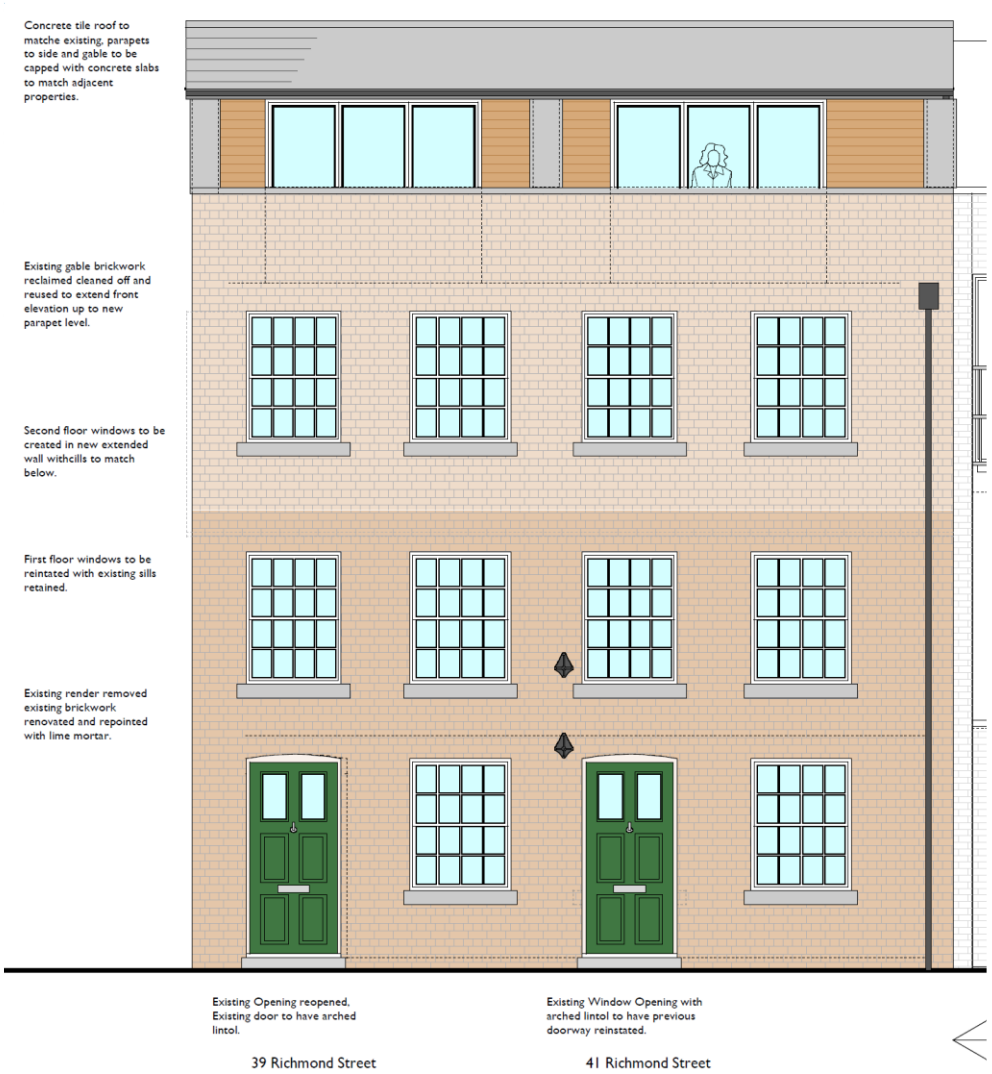


Figure 4
Proposed front elevation

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."

3.1.1 Council BS4142 criterion

Hitherto, there has been no mention of a BS4142 noise criterion.

However, section 11 d) of BS 4142:2014 says

"Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact"

Therefore, minimally, the Rating Level should not exceed the Background Level to ensure any potential noise has a low or no impact.

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.

3.3 COUNCIL NOISE CRITERIA

Guidance on noise and planning is given in the Manchester City Council's (MCC) document "Planning and Noise Technical Guidance" [3].

3.3.1 Residential noise criteria

Section 3.7.1.1 of the Planning & Noise Technical Guidance document [3:§ 3.7.1.1] states the following:

The Council has adopted the following noise limits for residential properties:

- ***Bedrooms (night time 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally exceed 45 dB $L_{Amax,F}$ by more than 10 times)***
- ***Living Rooms (daytime 07.00 - 23.00) 35 dB L_{Aeq}***
- ***Gardens and terraces (daytime) 55 dB L_{Aeq}***

These criteria have been adopted for the following reasons:

- *BS 8233: 2014 recognises these levels as a good standard for resting/sleeping conditions.*
- *The WHO document 'Guidelines for Community Noise' recommends an internal L_{Aeq} of 30dB for optimal sleep conditions (and no more than 35dB for internal rooms during daytime).*
- *The performance of acoustic insulation schemes can often be below that specified, according to the quality of installation, materials, noise spectrum and deterioration / wear and tear of building elements. A high design specification introduces a 'safety margin' should building elements not perform as well as expected ('on-site' performance).*
- *Performance specification for glazing does not usually take into account the detrimental effect of vents on the sound insulation. Even 'acoustic' vents will reduce the performance of the facade insulation, as they will inherently contain a free open area for air exchange.*

- *There is a general increase in urban noise levels, which can in the future be reasonably accommodated by these standards.*

- *The standards support the Local Authority corporate objective to prevent ill-health and improve local peoples' health and well-being. Bedrooms (night time - 23.00 - 07.00) 30 dB LAeq*

3.3.2 Industrial noise criteria

With regards to industrial noise, from external plant for example, [3:§ 3.7.1.5] states:

BS 4142 should be used to assess the likely impact of noise from industrial and commercial sources at noise sensitive premises (section 3.5). One of the indications of the impact of a BS 4142 assessment is the lower the Rating Level is relative to the measured Background 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 Level, this is an indication of the specific sound source having a low impact, depending on the context.

The Council considers that new developments should contribute and enhance the area in which they are located and where possible, contribute to the improvement of people's health and quality of life as per the NPSE. With this in mind, the design objective should be:

'The development should be designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

Where this criterion cannot be achieved, the various noise control measures considered as part of the assessment should be fully explained (i.e. relocation of noise sources, use of quieter equipment, enclosures, screening, restriction of the hours of operation) and the achievable noise level should be identified. This information will allow a judgement to be made concerning the application and its likely impact on the surrounding area.

In addition to the above, maximum noise levels should also be adequately controlled. Where particular uses generate high noise levels of a short duration (e.g. loud bangs) on a regular basis, these should aim to be controlled so as not to exceed 60 dB (L_{Amax}) at the façade of noise sensitive premises nearby in accordance with the recommendations of the WHO (section 3.6).

4 Measurement Details

In order to assess the external and internal noise levels of the proposed development, noise measurements have been taken at the front and rear of the building.

4.1 Rear

4.1.1 Monitoring overview

Personnel:	John Braiden, BSc & MSc Acoustics, MIOA.
Equipment:	NTi XL2 integrated real time analyser & B&K 4231 calibrator.
Weather	14- 18degC, <5m/s wind, 40-60% cloud
Time / Date:	11:02:04 Tues 25th – 12:13:16 Wed 26th October 2022.

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

Monitoring was unmanned.

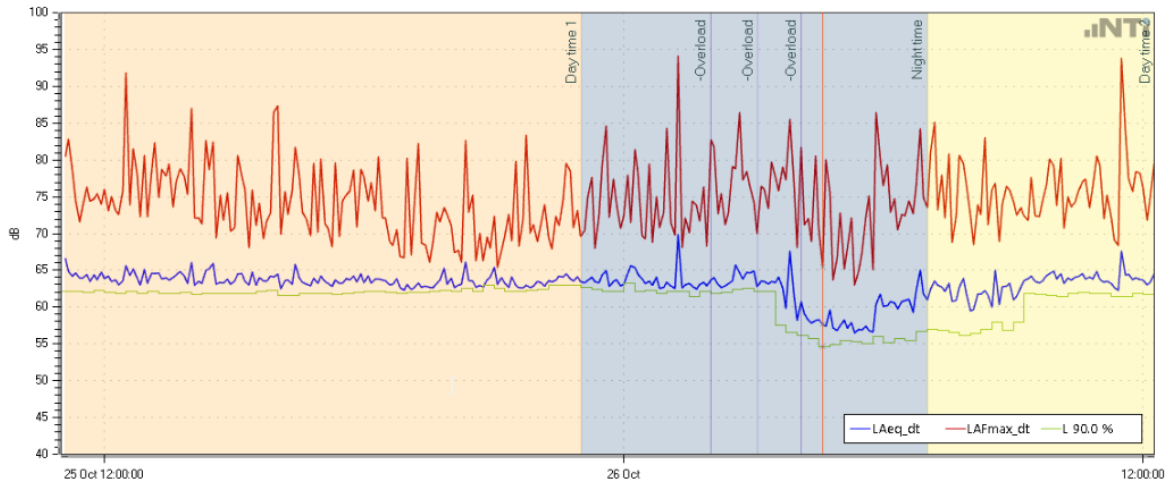
Background noise (L_{A90}), 'average' noise levels (L_{Aeq}) and maximum noise levels (L_{Amax}) where taken in 15-minute intervals.

4.1.2 Monitoring location

The microphone was attached to a bracket approximately 0.5m from the rear of the building at first floor level.

4.1.3 Monitoring results

Noise levels were measured continuously for 24 hours.



Cursor: Position=2022-10-26 04:35:00 LAeq_dt=57.6 dB LAFmax_dt=65.5 dB L 90.0 %=54.6 dB

Figure 5
Time history

The site is in a noisy area with external plant from McTurks takeaway close by (see Figure 6).

There are various other noise sources such as:

- patron noise including loud voices etc.
- road traffic noise
- sirens (due to city centre location)
- external plant (other than that mentioned above)

Figure 6
External plant attached to the side wall of McTurks. Application site is the grey building to the right.

A summary of the overall noise levels is given in Table 2

Day	Time		Duration	Time Period	L_{A90} dB	L_{Aeq} dB	L_{Amax} dB
	Start	Finish					
Tue	11:02:04	23:00:00	11:57:56	day	62	63.8	91.8
	23:00:00	07:00:00	08:00:00	night	56.2	62.7	82[1]
	07:00:00	12:00:00	05:00:00	day	57.7	63.4	93.8

Table 2
Summary of noise monitoring results - REAR

The night time max level is the level that is not exceeded more than 10 times during the night time period.

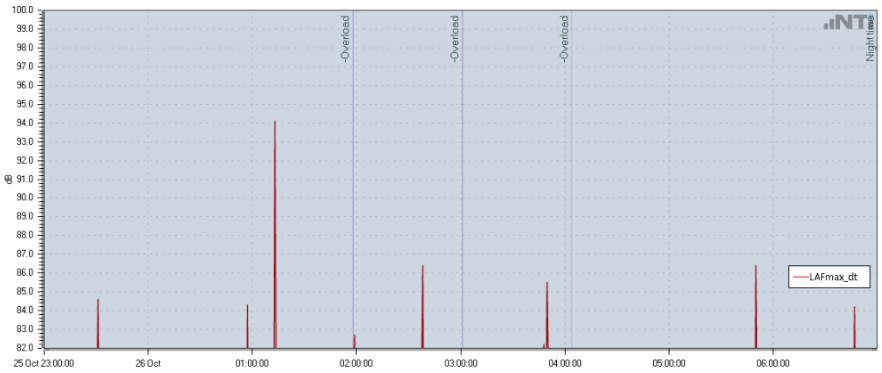


Figure 7
Max levels that were exceed no more than 10 times during the night.

Figure 7 shows that the max level of 82 was not exceeded more than 10 times during the night period.

The overall free field[2] noise levels are as follows:

L_{Aeq} (night) 63 – 3 = 60 dB(A)

L_{Aeq} (day) 64 – 3 = 61 dB(A)

4.1.3.1 Background noise level

It seemed that there was some sort of external plant running at any one time. However, Figure 5 shows that there is a definite drop in the background noise level around 03:35. As a worst-case scenario, the lowest $L_{A90,\,15min}$ is used at the basis for any BS 4142 assessment. According to Figure 5, the lowest $L_{A90,\,15min}$ was 54 dB.

4.2 FRONT

Noise levels for the front of the proposed development were taken from the Lighthouse Acoustics[3] report 0230/APR1, dated 6 April 2017, for the residential development across the road at 40 Richmond Street.

[1] the max level not exceeded more than 10 times during the night time period.

[2] Monitoring was not made in a free field location

[3] with permission from Robin Wood of Lighthouse Acoustics.

4.2.1 Monitoring location

Section 5.3 of the Lighthouse Acoustics report states:

Microphone at 1st floor level fixed to the front façade of existing commercial premises 51-53 Richmond Street overlooking the site and Richmond Street.

4.2.2 Monitoring results

The overall free field[4] noise levels for the front are as follows:

L_{Aeq} (night) 61 dB(A)

L_{Aeq} (day) 60 dB(A).

The two sets of noise data for the front and rear of the site are very similar. This is to be expected, as the rear monitoring location was more shielded from environmental noise than the front, but, on the other hand, was closer to external plant.

Furthermore, Section 5.5.3 of the Lighthouse Acoustics report also gives a max value of 82 dB L_{Amax} that is not exceeded more than 10 times.

5 Acoustic Assessment

The potential noise sources are:

1. environmental noise and
2. noise from the various external plant.

5.1 Industrial Noise Assessment

In order to determine the Specific Noise Level of the nearby plant, a histogram was used for the daytime noise data, up until 03:35, as this was dominated by noise from the nearby extract fan and duct.

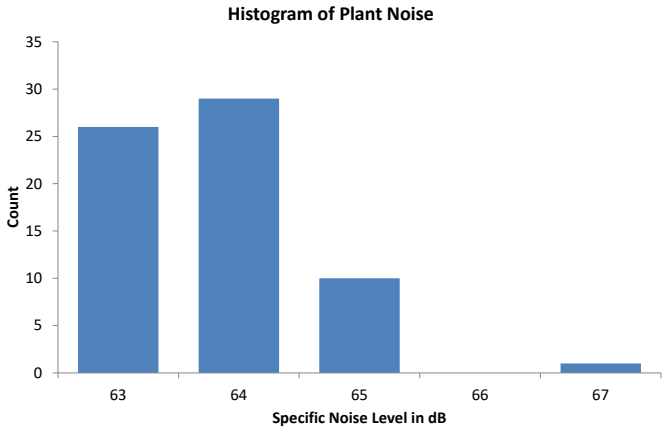


Figure 8
Histogram of plant noise

Figure 8 shows that the typical noise level of the nearby external plant is 64 dB. This is used as the Specific Noise Level in the BS 4142 calculation.

[4] Monitoring was not made in a free field location

BS 4142 Noise Assessment	Value	dB
Total Specific Noise Level @ NSR		64
BS 4141		
Tonality	0/2/4/4	0
Impulsivity	0/3/6/9	0
Intermittency	0/3	3
Rating Noise Level		**67**
LAF90_lowest		54
Rating minus Background		**-13**
Target Met?		×

Table 3
BS4142 assessment

Not surprisingly, the nearby plant do not conform to the 5dB criterion. Therefore, any mitigation suggested should give an acoustic performance of at least 18 dB.

5.2 ENVIRONMENT NOISE BREAK IN

Given the external noise levels, the initial glazing scheme can be suggested. However, it should be noted that this assumes windows closed in order to achieve the internal noise levels based on BS8233:2014.

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 level.

5.2.1 Façade effect

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

5.2.2 Distance correction

There was no distance correction applied as the monitoring location was representative of the location proposed residential dwellings.

5.2.3 Barrier effect

There is no barrier correction due to direct line of sight to the noise sources.

5.2.4 BS 8233 assessment

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

Noise levels will be attributed to all relevant elevations.

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[5]
REAR	night	bedroom	60	82	30	45	**38**	15 / (6-24) / 12.4 mm (6.6.1) LamiGlass
	day	lounge	61		35		**26**	6 / (6-16) / 4 mm
FRONT	night	bedroom	61	82	30	45	**37**	15 / (6-24) / 12.4 mm (6.6.1) LamiGlass
	day	lounge	60		35		**25**	4 / (6-16) / 4 mm

Table 4
Calculated SRI values and recommended glazing

Upgraded double glazing is required for all bedrooms with minimum sound reduction index of:

38 dB $R_w + C_{tr}$.

The above sound reduction index can be achieved with the following glazing specification:

Guardian LamiGlass 15 / (6-24) / 12.4 mm (6.6.1) LamiGlass.

5.2.5 Ventilation

The required internal noise levels will be achieved with windows open. However, an alternative ventilation method, other than opening windows, will be required for rapid cooling.

No ventilation strategy has been put forward, at the time of writing. However, acoustically treated mechanical ventilation will be required. This can take the form of individual in-wall units for relevant rooms or whole house systems. Nevertheless , a mechanical services engineer should be consulted to ensure that a suitable system is proposed.

Once a suitable ventilation system is proposed, then it will need to be assessed acoustically for both internal and external noise levels.

6 Conclusion

An acoustic survey has taken place at Vanilla 39-41 Richmond St, Manchester to assess noise levels from nearby industrial and environmental noise sources that may affect the proposed residential development.

There are significant industrial / commercial noise sources to the rear of the proposed residential property and in the wider local area. The predominant noise source was from a nearby extract duct at the rear. In addition, there was patron and commercial noise associated with the nearby commercial uses in The Village, as well as vehicular movements.

A Bs 8233 assessment has been carried out to both the front and the rear of the property. The following mitigation has been recommended:

- GuardianGlass 15 / (6-24) / 12.4 mm (6.6.1) LamiGlass windows to all bedrooms on all elevations.
- standard 4mmm double glazed units will suffice for daytime habitable rooms.

[5] Example glazing build up and performance from Guardian Glass – specifications and performance shown in Appendix. Other glazing build-ups available.

As well as the upgraded glazing, an acoustically treated mechanical ventilation system will need to be recommended by a suitably qualified engineer. Once a suitable ventilation system has been proposed, it must be assessed for both internal and external noise.

7 References

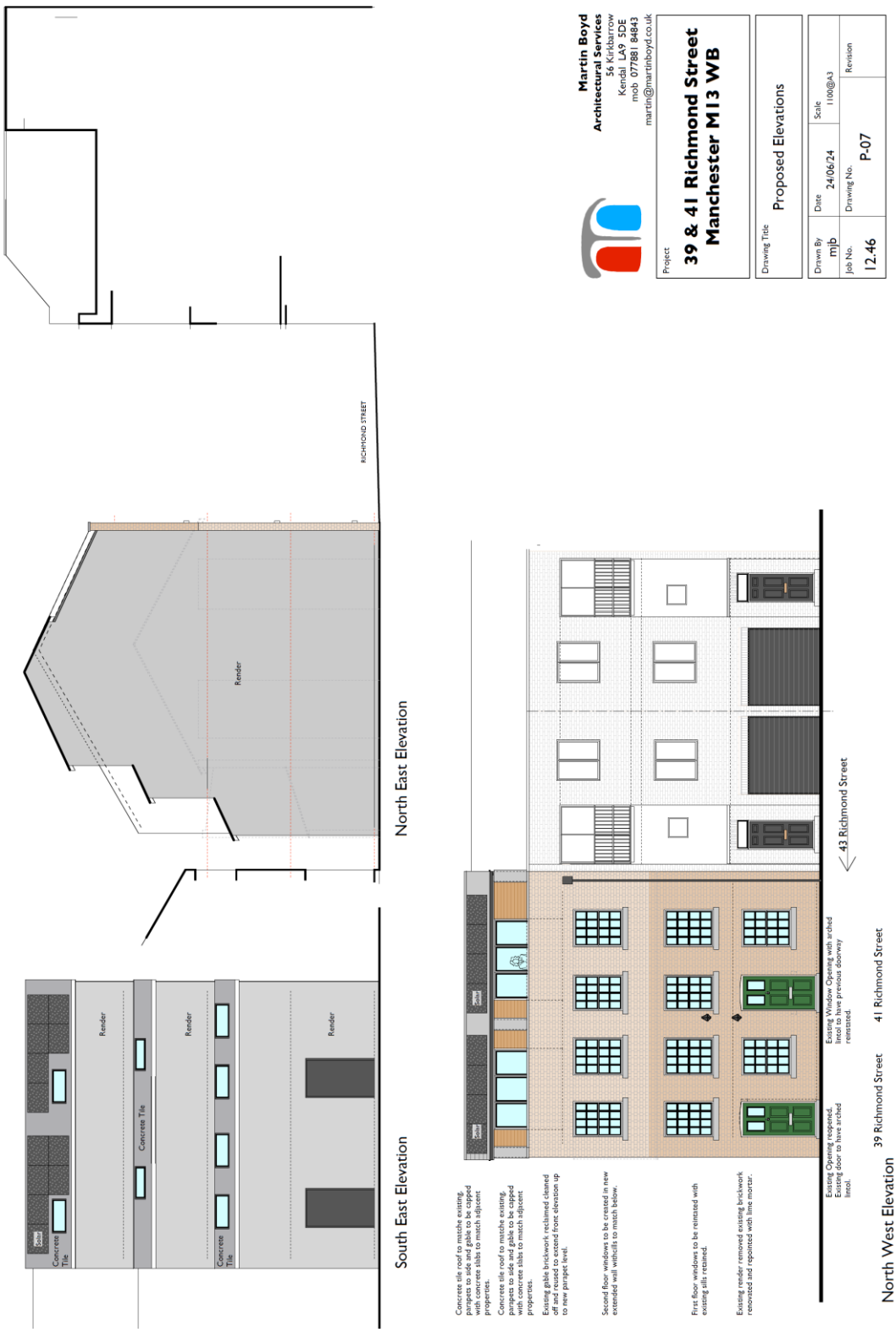
[1] BS 4142: 1997
Method for Rating industrial noise affecting mixed residential and industrial areas
British Standards Institute, 1997.

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

[3] Environmental Protection, Environmental Health
Planning and Noise Technical Guidance
Manchester City Council, October 2022.

Appendix

A1 PROPOSED DRAWINGS



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A2 GUARDIAN GLASS – GLAZING SPEC

GUARDIAN
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Acoustic Performance

Guardian LamiGlass

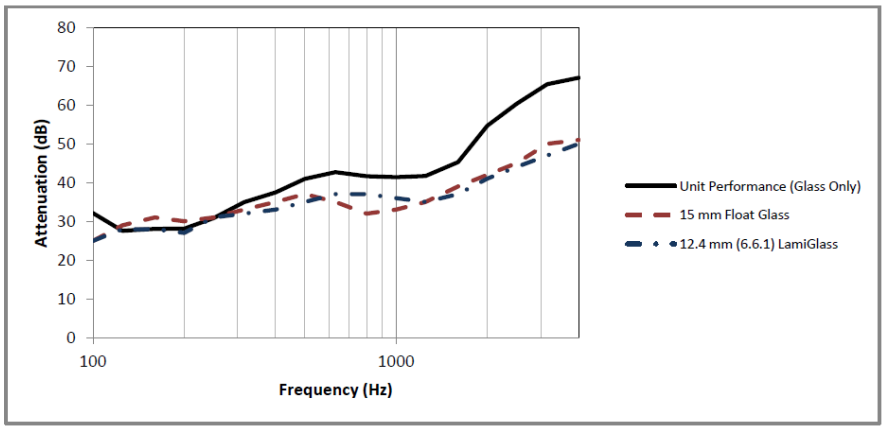
The acoustic performance data within this document is determined by calculation, based on factors derived from certified data. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 140-3, some variation in the calculated performance can also be expected. As such, the weighted performance, Rw, and adaptation terms, C and Ctr, should typically be considered to be accurate within ±2 dB. However, wider deviations can occur.

15 mm Float Glass

(6-24 mm Cavity)

12.4 mm (6.6.1) LamiGlass

Sound Reduction Indices - dB									
Frequency - Hertz						$R_w(C;C_{tr})$	R_w	$R_w + C$	$R_w + C_{tr}$
125	250	500	1000	2000	4000				
28	**31**	**41**	**41**	**55**	**67**	**42(-1;-4)**	**42**	**41**	**38**



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