

REPORT REF: 21490R01MWsw

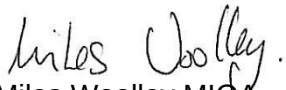
FLOOR AND FAÇADE REVIEW

PROPOSED GROUND FLOOR A3 UNIT, 38 – 41 HIGH STREET, WREXHAM

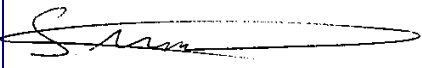


CLIENT: Clydesdale Project Management Limited
The Firs Cottage
School Lane
Ellesmere Port
Cheshire CH66 5PJ

Prepared by:


Miles Woolley MIOA Managing Director

Checked and approved by:


Sam Williams AMIOA Acoustics Consultant

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Executive Summary

Environoise Consulting Limited has been commissioned by Clydesdale Project Management to review the sound insulation performance of the separating floor between proposed ground floor restaurant and first floor residential. The façade strategy has also been reviewed with respect to maximum allowable restaurant music levels.

The site is situated in central Wrexham and consists of derelict terraced buildings (to be refurbished) bound by High Street to the north, Church Street to the west and Yorke Street to the east. The nearest residential receptors are 16m opposite the restaurant.

Recommendations are summarised below:

Proposed Separating Floor between Restaurant and First Floor Residential

The proposed separating floor is suitable providing recommended maximum ambient music levels are not exceeded.

Glazing to Residential

Glazing of 3mm outer sliding sash/ 150mm cavity/ 4mm fixed or side hung (not sash) or inner unit specification of 4mm pane/ 16mm cavity/ 4mm pane with ventilation by mechanical means to the front elevation will meet requirements. The same glazing can be specified at the rear or if replacement glazing then 4/6-20/4 Pilkington Standard Double Glazing 29dB R_w (-4 C_{tr}) would allow targets to be met.

Glazing to Restaurant

Secondary glazing must be 10mm laminated pane/ 200mm cavity/ 6.4mm laminated glazing with recommended maximum ambient music levels.

Music Noise Levels

Music noise levels must be limited to the following:

	$L_{eq,T}$ at octave band centre frequency (Hz)							$L_{Aeq,T}$ (dB)
	63	125	250	500	1k	2k	4k	
Recommended music level	74	76	76	76	76	74	71	81

Entrance doors

Entrance door must be lobbied with door closers so that both sets of doors are not open simultaneously.

Further Recommendations

Further detailed recommendations are given in sections 2.2, 3.2 and 3.4.

Appendix A and B show calculations and risk management schedule.

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1 Criteria

1.1 Separating Floor Performance Target

- 1.1.1 The specification of the separating floor between restaurant and apartments will be determined by the level of restaurant noise and internal noise criterion to be achieved within first floor apartments. Target values are derived from guidance given in Table 4 of BS 8233 'Guidance on sound insulation and noise reduction for buildings'ⁱ and World Health Organisation (WHO) Guidelines; 'Community and Noise, 1999'ⁱⁱ, see Table 1.1.

Table 1.1: Recommended internal noise level targets.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB $L_{Aeq,16hour}$	
Sleeping (daytime resting)	Bedroom	-	30dB $L_{Aeq,8hour}$ 45dB $L_{Amax,fast}$

- 1.1.2 The sound insulation target should be at least 10dB less than the target internal levels so should be 20dB $L_{Aeq,8hour}$ (30dB $L_{Aeq,8hour}$ - 10dB) i.e. NR15 $L_{eq,T}$.

1.2 Noise within Restaurant

- 1.2.1 Noise within the restaurant should be between 40dB and 55dB $L_{Aeq,T}$ according to Table 2 of BS 8233:2014.

1.3 Music Noise Egress

- 1.3.1 Restaurant music should achieve 'inaudibility' at the nearest dwellings (to reduce possibility of adverse comment) defined as follows:
- Music levels ($L_{Aeq,15min}$) should be less than 10dB below the measured background noise level ($L_{A90,15min}$) at 1m from the nearby residential properties.
 - Music levels ($L_{eq,15min}$) should be less than 10dB below the measured background noise level ($L_{90,15min}$) in each octave band between and including 63Hz and 4kHz.

2 Restaurant Break-Through Noise

2.1 Assessment

2.1.1 A noise break-through calculation has been done considering a typical 'busy restaurant' noise levelⁱⁱⁱ, see Table A1, Appendix A. The proposed floor has a calculated sound insulation performance of 63dB R_w with the proposed build-up as follows:

- 'Hush Board 28' over existing 18mm thick timber floorboards supported on;
- 200mm deep timber joists with;
- Two layers of staggered 15mm thick British Gypsum SoundBloc board hung on 100mm deep resilient hangers with;
- 100mm thick mineral wool insulation in the formed cavity.

2.2 Recommendation

2.2.1 The proposed separating floor is acceptable providing ambient noise levels do not exceed the spectra given in Table 2.1.

Table 2.1: Recommended maximum ambient restaurant music levels.

	L _{eq,T} at octave band centre frequency (Hz)							L _{Aeq,T} (dB)
	63	125	250	500	1k	2k	4k	
Recommended music level	74	76	76	76	76	74	71	81

External Walls

2.2.2 The external walls are noted to be dense masonry which should be sufficient to control flanking sound transmission providing walls are made good.

Service Penetrations

2.2.3 Any pipes that penetrate the first floor should be lagged for their interior run with 25mm thick mineral wool insulation and boxed in with two layers of 15mm Gyproc SoundBloc (25.2kg/m²).

3 Apartment Noise Ingress

3.1 Assessment

- 3.1.1 Detailed octave band noise ingress calculations have been done in accordance with BS EN ISO 12354-3:2017 'Building acoustics. Estimation of acoustic performance of buildings from the performance of elements. Airborne sound insulation against outdoor sound'^{iv} using measured noise levels (from surveys done between 10.00hrs on Tuesday 6th August 2019 and 11.00hrs on Wednesday 7th August 2019) shown in Table 3.1.

Table 3.1: Front and rear noise levels used in residential ingress assessment.

Time Period	L _{eq,T} at octave band centre frequency (Hz)							L _{Aeq,T} (dB)
	63	125	250	500	1k	2k	4k	
Ambient Daytime (07.00 – 23.00) - front	68	63	42	57	57	53	47	61
Ambient Night-time (23.00 – 07.00) - front	61	57	39	52	52	49	44	57
Ambient Daytime (07.00 – 23.00) - rear	55	52	31	50	48	45	39	52
Ambient Night-time (23.00 – 07.00) - rear	47	44	28	48	45	43	37	50

- 3.1.2 In both cases due to the longer 15-minute measurement interval the 4th highest maximum noise levels have been used for a robust assessment.

Table 3.1: Front and rear noise levels used in residential ingress assessment.

Time Period	L _{Max,fast} at octave band centre frequency (Hz)							L _{Amax,fast} (dB)
	63	125	250	500	1k	2k	4k	
Night-time (23.00 – 07.00) - front	63	77	53	69	76	76	71	80
Night-time (23.00 – 07.00) - rear	46	45	31	52	71	58	49	72

3.2 Recommendation

- 3.2.1 Target requirements given in Table 1.1 will be met with 3mm outer sliding sash pane/ 150mm cavity/ 4mm fixed or side hung (not sash) or inner unit specification of 4mm pane/ 16mm cavity/ 4mm pane with ventilation by mechanical means.
- 3.2.2 The same glazing can be specified at the rear or if replacement glazing then 4/6-20/4 Pilkington Standard Double Glazing 29dB R_w (-4 C_{tr}) would allow targets to be met.

4 Restaurant Façade Review

4.1 Prevailing External Noise Levels

- 4.1.1 A noise break-through assessment has been done into the restaurant considering measured noise levels given in Environoise report 21265R01aSWmdw. Noise levels were 71dB $L_{Aeq,16hour}$ and 57dB $L_{Aeq,8hour}$ for day and night-time periods, respectively.

4.2 External Noise Ingress Assessment & Recommendation

- 4.2.1 To determine required glazing performance with ventilation by mechanical means we have adopted the simplified procedure guidance given in Annex G of BS 8233:2014 and used the higher daytime noise level. Glazing with a minimum sound insulation performance of 35dB R_w will meet external noise ingress requirements.

4.3 Restaurant Music Egress

Assessment

- 4.3.1 An assessment of predicted music noise at receptors opposite the restaurant has been done using measured data, see Table A2, Appendix A. Target criteria is given in Table 4.1.

Table 4.1: Target music level at receptor.

	Octave band centre frequency (Hz)							A weighted level (dB)
	63	125	250	500	1k	2k	4k	
Measured background noise level L_{90}	42	41	20	33	33	26	17	37
Target music level at receptor (background noise level -10dB)	32	31	30	23	23	16	7	27

- 4.3.2 External walls have not been assessed as 500mm thick but proposed secondary glazing (with 10mm glass/ 200mm cavity/ 6mm glass specification) and 44mm solid core entrance doors have been considered. The assessment shows requirements are met, see Table 3.1.

Recommendations

Glazing

- 4.3.3 All High Street windows should have 10.4mm laminated pane/ 200mm cavity and 6mm laminated pane. All windows must be fixed window (not sliding sash) or side hung onto neoprene gaskets, with music levels based on Table 2.1.

Existing Door

- 4.3.4 The existing door to be infilled must be infilled with brick or dense block ($>1450\text{kg/m}^3$) for the full depth of the wall.

Entrance Foyer

- 4.3.5 Both doors should be 54mm solid core doors with head, perimeter bulb or compression seals and suitable meeting stile seals. Threshold seals would also help improve the performance of the doors.

Drop threshold seals work best but could improve impractical so we recommend a rubber wiper threshold seal.

- 4.3.6 Both doors should have automatic door-closers with both doors should be well spaced apart so that doors cannot be simultaneously opened. The floor to the entrance lobby should be carpeted.

Appendix A: Calculations

Table A1: Calculation of restaurant noise breakthrough to first floor residential.

Calculation Step	Level at octave band centre frequency (Hz)							L _{Aeq,T} (dB)
	63	125	250	500	1k	2k	4k	
Source Noise Level in Bar (busy restaurant)	60	70	75	75	75	75	70	80
NR15 L _{eq,T}	47	35	26	19	15	12	9	
Sound reduction Index (R) according to (Insul)	32	46	55	62	66	67	67	
3dB correction for lightweight construction	29	43	52	59	63	64	64	
RT (seconds)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
A (∞)	9	9	9	9	9	9	9	
S (m ²) (assumed large area)	16	16	16	16	16	16	16	
Transfer Level	33	29	25	18	14	13	8	
Excess over target (transfer level - noise target)	-14	-6	-1	-1	-1	1	-1	
Recommended music level (source level - excess)	74	76	76	76	76	74	71	80

Table A2: Restaurant music egress assessment.

ENVIRONOISE		High Street Receptor						
Project	Proposed A3 Restaurant, High Street, Wrexham							
Client	Clydesdale Project Management Limited							
Receive Room	High Street Receptor							
Description of Source Restaurant music					E 1 -	All front elevation glazing		
					E 2 -	Front Doors		
					E 3 -	Description		
					E 4 -	Description		
Element 1	All front elevation glazing				Directivi		4	
Element area	7.6 m²							
Receiver	Description							
Distance to Receiver	16 m							
Facade Correction	0 dB				Freefield = 0dB			
Frequency Hz	63	125	250	500	1000	2000	4000	dB(A)
Internal Level dB	74	76	76	76	76	74	71	81
SRI of element	31	35	46	46	46	56	65	
Additional Directivity								
Shielding								
Additional Correction								
External Freefield Level at Receiver								
Element 1	17	15	4	4	4	-8	-20	7
A-weighted	-9	-1	-5	1	4	-7	-19	
Element 2	24	23	19	20	20	11	1	23
A-weighted	-1	7	11	17	20	12	2	
Element 3	-	-	-	-	-	-	-	-
A-weighted	-	-	-	-	-	-	-	
Element 4	-	-	-	-	-	-	-	-
A-weighted	-	-	-	-	-	-	-	
Total	25	24	19	20	20	11	1	23
A-weighted	-1	8	11	17	20	12	2	
Criterion	32	31	30	23	23	16	7	
Required Attenuation	0	0	0	0	0	0	0	

Appendix B: Risk Management Schedule

Table B1: Assessment of risks with control measures.

Severity Classifications (S)	Probability Classifications (P)	Degree of Risk (R)
1. Minor – Minor accident, resulting in no serious injuries or lost time; little or no damage to property or the environment.	1. Improbable – no known instances of such an event occurring.	0 – 5 = Low Risk; ensure controls are adhered to and activity need not alter.
2. Moderate – Potential injury necessitating less than 3 days off work; damage to property or the environment requiring remedial work.	2. Remote – experience suggests that event rarely occur.	6 – 10 = Moderate Risk; tolerable, but efforts should be made to reduce the risk where cost effective and reasonably practicable.
3. Serious – Accident reportable under RIDDOR 95; serious damage to property or the environment.	3. Possible – experience shows that events occur on occasions.	11 – 15 = Substantial Risk; all practicable measures must be taken to reduce the level of risk; tolerable only where further risk reduction is impracticable or disproportionate to the risk involved.
4. Major – Accident resulting in serious or permanent injury; major or permanent damage to property or the environment.	4. Probable – experience shows that events occur frequently.	16 – 25 = Extreme Risk; Unacceptable except in extraordinary circumstances; all control measures must be taken regardless of cost.
5. Catastrophic – Accident resulting in death or severe disablement; destruction of property; irreversible damage to the environment.	5. Likely – very likely to happen unless actively prevented.	>26. Works must be aborted, and project need to be reviewed.

Table B1 (continued): Assessment of risks with control measures.

Activity	Hazard	Consequence	Degree of Risk			Risk Control Measures	Residual Risk			Risk Owner
			S	P	R		S	P	R	
Access to/from site	Tripping or slipping hazards and falling objects.	Low risk	2	2	4	Take due care and attention to avoid tripping hazards. Do not work externally at height. Always sign in and out of site if required.	2	1	2	Contractor and consultant
Lifting or moving blockwork	injury through heavy load or improper lifting technique	Low risk	2	3	6	Blocks should be less than 20kg. Workers should wear gloves, steel toe cap boots and protective glasses. Workers must lift by bending their knees not their back. Make sure path is not obstructed by items being carried.	2	2	4	Contractor
Handling sheets of plasterboard	Injury through heavy load or improper lifting technique	Low risk	2	3	6	Plasterboard handled should be less than 20kg per sheet. Regardless of the mass several contractors may be needed to carry boards. Workers should wear gloves, steel toe cap boots and protective glasses. Workers must lift by bending their knees not their back. Make sure path is not obstructed by items being carried.	2	2	4	Contractor
Handling sheets of glass	Injury through heavy load/ improper lifting technique or laceration	Moderate	3	3	9	Detailed review of handling and positioning of glass to be done before installation by contractor. Glazing may need to be craned into position due to high mass. All glazed units must be clearly marked with tape/ marker to avoid people walking into the glass. Glazing must be handled with appropriate gloves only. Regardless of the weight, several contractors may be needed to carry units. Workers should wear gloves, steel toe cap boots and protective glasses. Workers must lift by bending their knees not their back. Make sure path is not obstructed by items being carried.	3	2	6	Contractor
Dust inhalation	Injury through being temporarily blinded of damage to lungs	Low risk	2	3	6	Only work in well ventilated space and wear appropriate PPE including dust mask. If cutting material make sure gloves are worn. Signage may be required to prevent other workers entering the space.	2	2	4	Contractor

Table B1 (continued): Assessment of risks with control measures.

Activity	Hazard	Consequence	Degree of Risk			Risk Control Measures	Degree of Risk			Risk Owner
			S	P	R		S	P	R	
Hearing damage	Injury to hearing or consequence of verbal communication not being heard	Moderate	3	3	9	Review of construction or demolition methods and all workers exposed to high levels of noise to be provided with suitable hearing protection. In the case of sound insulation testing, suitable signage should be used to warn contractors of high noise risk to certain rooms.	3	2	6	Contractor. Contractor and acoustic consultant for sound insulation tests.
Social distancing	Spread of Corona virus	Potential injury	4	3	12	Lone travelling. Compliance with signage. <u>Suitable distancing</u> : stay ≥2-metre distance from others on and off site. <u>Suitable PPE</u> : Wear gloves and face mask when in proximity (but still exceeding 2 metres) of others. Discard / remove gloves following site visit and apply antibacterial hand wash following direct contact with surfaces.	4	2	8	Contractor and consultant
Feel ill (temperature or persistent cough)	Spread of Corona virus	Potential injury	4	3	12	Do not come to work if you have a high temperature, have a persistent cough or are living with someone who has – always let your employer know. If a worker develops a high temperature or a persistent cough while at work, they should: • Inform their manager and site manager ideally by phone. Return home immediately. • Avoid touching anything. • Cough or sneeze into a tissue and put it in a bin, or if they do not have tissues, cough, and sneeze into the crook of their elbow. They must then follow the guidance on self-isolation and not return to work until their period of <u>self-isolation</u> has been completed.	4	2	8	Contractor and consultant

References

- ⁱ BS 8233 'Guidance on sound insulation and noise reduction for buildings', 2014.
- ⁱⁱ World Health Organisation (WHO) Guidelines; 'Community and Noise, 1999'
- ⁱⁱⁱ 'The Little Red Book of Acoustics: A Practical Guide', 3rd edition, 2013.
- ^{iv} BS EN ISO 12354-3:2017 'Building acoustics. Estimation of acoustic performance of buildings from the performance of elements. Airborne sound insulation against outdoor sound'.