



Ref: P5026/L01/DMT (email attachment)

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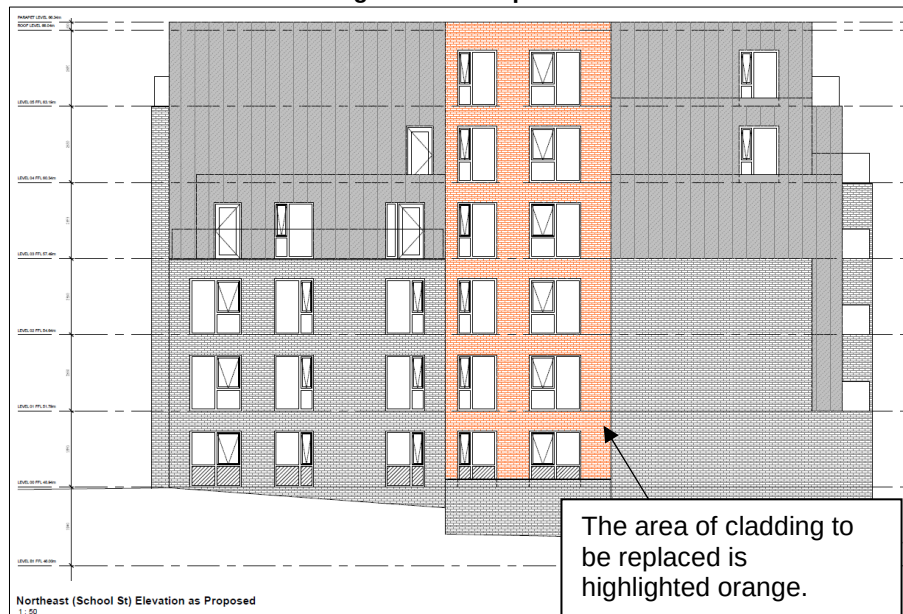
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Halo House, 27 Simpson Street - Acoustic Assessment of Replacement Cladding

1.0 Introduction and Proposals

- 1.1 AEC has been instructed, by BTP Architects Limited, on behalf of the Forshaw Group Ltd, to undertake a desktop assessment of the potential acoustic implications of replacing a specific area of cladding on the existing apartment building at Halo House, 27 Simpson Street, Manchester, M4 4GB.
- 1.2 Acoustic terminology used in this letter is summarised in Appendix A.
- 1.3 The existing zinc cladding will be removed from a section of the School Street elevation, identified in Figure 1.1 below.

Figure 1.1 – Proposed Area of Works



- 1.4 There are three options for replacing the cladding. The options are summarised below and indicated on the drawing presented in Appendix B, as provided by BPT Architects:

- **Existing** – 2x15mm Soundbloc, 100mm 'C' stud fully filled with insulation, 12mm weatherboard, 200mm SFS with 80mm Kingspan K15 and zinc cladding system
- **Option 1** – As Existing, with cladding system replaced by 102mm brick, tied back to the weather board with 130mm cavity partially filled with stone wool insulation
- **Option 2** – As Option 1, with 130mm cavity fully filled with stone wool insulation
- **Option 3** – As Existing, with cladding system replaced by proprietary brick slip cladding, 180mm cavity fully filled with insulation

- 1.5 A noise assessment was undertaken by ADT Noise and Vibration Consultants in September 2017 (report ref: ADT 2623/ENIA), which outlined the external noise levels impacting the building and the acoustic specifications and assumptions for the building envelope design. This report has been provided to AEC for reference and is referred to as “the ADT noise report” hereafter.
- 1.6 A first-floor plan produced by DLA Architecture (Ref: 2014-269/221 Rev:C7) has also been provided and used to obtain the typical room dimensions and window widths, required when predicting noise break-in.

2.0 Acoustic Assessment

- 2.1 This assessment considers the potential for the replacement cladding to adversely impact the existing sound insulation of the building envelope and cause increases in the resulting noise levels inside the residential apartments.
- 2.2 The internal noise level criteria are as follows:
- Bedrooms/Living rooms in the daytime: (0700-2300h) Ambient = 35dB_{L_{Aeq,16hr}}
 - Bedrooms during night-time: (2300-0700h) Ambient = 30dB_{L_{Aeq,8hr}}
Maximum = 45dB_{L_{Amax,F}}
- 2.3 Noise break-in calculations have been undertaken in general accordance with the guidance in BS 8233:2014 “*Guidance on sound insulation and noise reduction for buildings*” (BS8233).
- 2.4 The noise break-in calculations are based on the following data:
- The external noise level spectra provided in the ADT noise report
 - Glazing and ventilator sound insulation spectra in the ADT noise report
 - Bedroom dimensions (2.9m x 4.9m x 2.3m) based on first floor plan
 - Glazing area based on elevations
 - Façade (external wall) sound insulation spectra for the existing and the proposed options, based on the ADT noise report and predictions using Insul© software and AEC’s professional experience.
- 2.5 The glazed area is approximately 47% of the building envelope to the bedroom, with the remaining 53% comprising the external wall including cladding.
- 2.6 Based on all the information above, the following internal noise levels have been calculated (an example calculation is provided in Appendix C):

Table 2.1 – Summary of Results

Room, Period and Noise Index	Criteria (dB)	Existing (dB)	Option 1 (dB)	Option 2 (dB)	Option 3 (dB)
Bedroom/Living Room – Daytime Ambient - $L_{Aeq,16hr}$	35	34.4	34.3	34.3	34.4
Bedrooms – Night-time Ambient $L_{Aeq,8hr}$	30	28.5	28.5	28.5	28.5
Bedrooms – Night-time Maximum $L_{Amax,F}$	45	40.4	40.3	40.3	40.4

3.0 Assessment Summary

- 3.1 The assessment and the noise break-in calculations have been undertaken in general accordance with the guidance in BS8233.
- 3.2 Options 1 and 2 have a higher sound insulation performance than the existing cladding. However, this only translates to a negligible 0.1dB reduction in the internal noise levels. The acoustic benefit of the full fill stone wool in Option 2, compared to the partial fill stone wool in Option 1, is negligible.
- 3.3 Option 3 has a similar sound insulation performance to the existing cladding and there is no change in the internal noise levels predicted compared to the existing situation.
- 3.3 In summary, because the existing internal noise levels are dominated by the sound insulation performance of the large glazed areas and any ventilators, the sound energy contribution via the cladding (external wall) is negligible and remains negligible with all three options. This is demonstrated by the results in Table 2.1 above.
- 3.4 Based on the above, noise should not be a determining factor when deciding which replacement cladding option to select and all options, correctly installed, will not adversely impact on the internal noise levels inside the residential apartments.

APPENDIX A – ACOUSTIC TERMINOLOGY

Sound Description

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (*Hz*), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discrete frequency - a 'pure tone' - most sound is made up of many different frequencies.

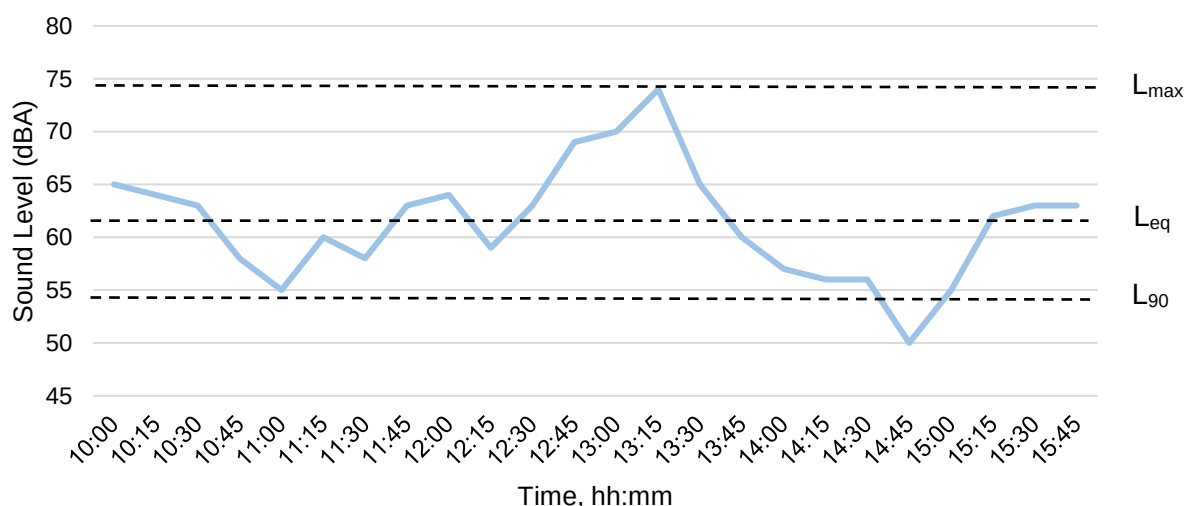
The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The *dBA* weighting emphasises or reduces the importance of certain frequencies within the audible range.

Sound Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the sound.

The figure below shows an example of sound level varying with time. Because of this time variation, the same period of sound can be described by several different levels. The most common of these are described below. It should be noted that in many instances in the main body of text, the unit will be preceded by a dB descriptor in the report e.g. $L_{Aeq,T}$ could be written $dB L_{Aeq,T}$.

Example of Sound Varying with Time



Unit Type	Acoustic Unit	Description
Ambient Sound Level	$L_{Aeq, T}$	The equivalent continuous (A-weighted) sound level. It may be thought of as the “average” sound level over a given time, T. It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises and can be considered as the “ambient” noise level.
Background Sound Level	L_{A90}	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe background noise.
Maximum Sound level	L_{Amax}	The maximum (A-weighted) sound level measured during a given time. ‘Fast’ or ‘Slow’ meter response should be cited.
Free-field Level	-	This refers to the sound level measured outside, away from reflecting surfaces.
Sound reduction index	R_w	Single number rating used to describe the <u>laboratory</u> airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
A road traffic spectrum adaptation term	C_{tr}	Referenced to demonstrate the to the low frequency sound insulation performance of building elements. Makes reference to the A-weighted urban traffic noise spectrum.
Element normalized level difference	$D_{n,e,w}$	Single number rating used to describe the sound insulation performance of small elements.

APPENDIX B – CLADDING OPTIONS

Note: Details and dimensions of existing build up taken from DIA Architects as built drawings. Contractor to confirm all dimensions prior to placing orders. Existing Zinc Cladding U-value 0.15 W/m²K	Option 1 Masonry Construction Partial Fill Cavity Insulation Stone Wool Indicative U-value 0.19 W/m²K	Option 2 Masonry Construction Full Fill Cavity Insulation Stone Wool Indicative U-value 0.15 W/m²K	Option 3 Proprietary Brick Slip System Partial Fill Cavity Insulation Stone Wool Indicative U-value 0.13 W/m²K
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APPENDIX C – EXAMPLE ACOUSTIC BREAK-IN CALCULATION

Option 1 – LAeq Day

Sound Pressure Level in a Room Based on BS 8233:1999 Table 4 - Maximum										
TITLE:	Noise Break-In Calculation - Option 1							47.23 % glazing		
C/No	P5026 - Halo House - Bedroom									
BS 8233:1999		Design criteria								
A0	10 m^2	Leqff	Sound level outside room elements					Dne	Normalised level difference of vent	
Sf	6.67 m^2	A0	reference absorption					Rwi	Rw of window	
Srr	14.21 m^2	Sf	total façade area including window					Rew	Rw of wall	
S	20.88 m^2	Srr	ceiling area					Rrr	Rw of roof	
Swi	3.15 m^2	S	total area of elements (Sf+Srr)							
Sew	3.52 m^2	Swi	area of the windows							
V	32.683 m^3	Sew	area of the external wall							
CALCULATION										
Leq ff	A	63	125	250	500	1000	2000	4000	8000	dB(A)
Weighting		-26	-16	-9	-3	0	1	1	-1	
Weighted pressure level		10000	39811	100000	251189	794328	501187	63096	7943	1767554
Dn,e		36	36	36	35	33	29	31	38	
A0/S.10^(-Dn,e/10)	B	0.00012	0.00012	0.00012	0.00015	0.00024	0.00060	0.00038	0.00008	
Rwi		19	24	25	36	44	43	45	47	
Swi/S.10^(-Rwi/10)	C	0.00190	0.00060	0.00048	0.00004	0.00001	0.00001	0.00000	0.00000	
Rew		35	46	49	55	56	56	60	60	
Sew/S*10^(-Rew/10)	D	0.00005	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
Rrr		50	52	57	60	67	70	75	75	
Srr/S*10^(-Rrr/10)	E	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
10*log(B+C+D+E)	F	-26.8	-31.4	-32.2	-37.2	-36.1	-32.1	-34.1	-41.0	
T		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
A (furnished)		10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	
10*LOG(S/A)	G	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Leq,2	A+F+G+3	45.2	36.6	32.8	25.8	28.9	29.8	18.8	5.0	
A weighting		-26	-16	-9	-3	0	1	1	-1	
Leq wted		19.2	20.6	23.8	22.8	28.9	30.8	19.8	4.0	dB(A)
		82.33	114.96	237.86	189.49	775.43	1212.23	96.26	2.49	34.3