

Martec Environmental Consultants Ltd.

Waterbrow Wood, Gressingham, LANCASTER LA2 8LX

Tel: 01524 222000

Email: info@martecenviro.co.uk Website: www.martecenviro.co.uk

GLAZING & VENTILATION SPECIFICATION

Barclay House,
53 Whitworth St West
Manchester M1 5NG

Client:
Mr Ka Fan

Report Date: 13th August 2018

Ref: 20180813 8016 Manchester ProPG-2.docx

Site Visit by: M A Kenyon

Site Visit date: 18th to 25th September 2017

Prepared by: M A Kenyon MSc BSc MIOA



Checked by: D A B Kenyon BSc Hons. CIEH MIOA



Loughborough Office:

8 Bayliss Close,
Quorn, Loughborough, LE12 8PF

Ormskirk Office:

131 New Court Way, Ormskirk, Lancs L39 2YT

Staffordshire / Cheshire Office:

2, Betley Hall Gardens, Betley, Crewe CW39BB

CONTENTS

1.0	INTRODUCTION	3
2.0	PROJECT BACKGROUND	3
3.0	ASSESSMENT CRITERIA	4
4.0	MEASUREMENT RESULTS	5
5.0	GLAZING AND VENTILATION PREDICTIONS	6
6.0	ASSESSMENT	7
7.0	GLAZING AND VENTILATION SPECIFICATION	8
	APPENDIX 1.....	9
	APPENDIX 2.....	10
	APPENDIX 3.....	11
	APPENDIX 4.....	12

1.0 INTRODUCTION

Howard & Seddon Architects, acting on behalf of their client Mr Ka Fan, instructed Martec Environmental Consultants Ltd to prepare an acoustic glazing and ventilation specification at Barclay House, 53 Whitworth St West, Manchester M1 5NG.

It is understood that prior approval [Under Class O of the General Development Order 2015] has been obtained for the change of use of offices to residential apartments.

This report follows on from our earlier report which detailed the results of the external noise measurements [Ref.20170927 8016 Whitworth-1].

This report details the measurements taken on this site, briefly considers the requirements of current government guidance and makes recommendations for noise mitigation as necessary. Acoustic Terminology is set out at Appendix 1, the consultants' qualifications are at Appendix 2 with References at Appendix 3, and detailed noise prediction results at Appendix 4.

2.0 PROJECT BACKGROUND

The building is located close to the centre of Manchester and the front façade overlooks Whitworth Street West as well as the railway viaduct on

the western approaches to Manchester Oxford Road Station. The rear of the building is located on the Rochdale Canal towpath.

The front [south] façade is affected by both road traffic and railway noise, as are the side facades [west and east], the rear [north] façade is affected by more distant road traffic noise from the city centre.

The internal design and layout of the building had not been finalised prior to our original report and predictions of internal noise levels could not be made. Howard and Seddon Drawing numbers 12,982 – 22B, 23B, 28B, 29B, 230G, 231F, 232F and 233F have now been provided for the purposed of predicting internal noise levels and selecting appropriate glazing and ventilation.

3.0 ASSESSMENT CRITERIA

Appropriate Criteria were considered in more detail in our earlier report [Ref.20170927 8016 Whitworth-1]. A brief summary follows.

The ProPG's [Ref.1] target noise levels are broadly as set out in BS8233:2014 [Ref. 2] with additional guidance on nighttime noise events based on World Health Organisation advice.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 LAeq,16hr	--
Dining	Dining Room/Area	40 LAeq,16hr	--
Sleeping (daytime resting)	Bedroom	35 LAeq,16hr	30 LAeq,8hr 45 LAm _{ax} ,F [1]

Table 1: ProPG - Target Internal Noise Levels

[1] Added from WHO and applies to 10th highest nighttime event.

The footnotes to this table make it clear that the guidance is based on the current WHO recommendations and that the above internal levels can be relaxed by 5dB to achieve “reasonable” internal conditions.

4.0 MEASUREMENT RESULTS

The measurements presented in more detail in our earlier report [Ref.20170927 8016 Whitworth-1]. Summary results are as shown in Table 2:

Location	Day LAeq,16hr	Night LAeq,8hr	Night LAm _{ax} ,F
Front of Building	65	64	85
Rear of Building	55	52	75

Table 2: Collated External Levels [dBA free field]

The measurements have been further analysed to provide spectra for the purposes of predictions as shown in Table 3 below. The spectra used for LAmax predictions is the log average of the nighttime LA01 results, the LAeq is the average of the daytime and nighttime LAeq results.

	Octave Band Centre Frequency [Hz]				
	125	250	500	1k	2k
LAmax - Front	74.2	73.9	71.9	73.3	69.3
LAeq - Front	64.3	63.4	62.7	64.4	58.8
LAmax - Rear	63.3	60.9	58.0	60.2	56.2
LAeq - Rear	50.9	54.2	58.9	62.1	62.3

Table 3: Calculation Spectra [dBA free field]

5.0 GLAZING AND VENTILATION PREDICTIONS

It is possible to predict internal noise levels based on the measured external levels detailed in Table 2, the spectra from Table 3, room and window dimensions taken from the Howard & Seddon Architects drawings and the provisions of Reference 5.

We have assumed that the ventilation will either be Approved Document F “System 3” with vents as indicated, or “System 4” with no vents, in which case the internal levels are slightly over-predicted. In either instance the ventilation system should designed do not allow significant noise to enter from the outside, either because of the system's attenuation or because it vents to/from a quiet façade or location.

The predictions for various apartments are contained within Appendix 4. It has been assumed that the reverberation times for living rooms, bedroom and studio apartments are 0.5s, 0.3s and 0.4s respectively.

It is understood that for studio apartments the sleeping areas would be contiguous with the living space and the predictions have been performance on this basis.

6.0 ASSESSMENT

Predictions A4.1 to A4.3 demonstrate at the front of the building that the most critical target to meet in the nighttime L_{Amax} levels, i.e. if the glazing and ventilation meet this requirement, the other requirements will be met. Similarly, predictions A4.10 and A4.11 demonstrate this for the rear of the building.

The predictions demonstrate that for apartments with a view of Whitworth Street West that 10mm glass/20mm air gap/8.4mm acoustic laminate glass [Saint Gobain data] would be appropriate, and if vents are required, that two Greenwood MA3051 acoustic vents would not prejudice the attenuation.

Similarly, for the rear façade of the building [no view of Whitworth Street West], that 10/12/6 glazing would be appropriate and if required, two

Passivent TVALdB 450 Window Frame vents would not prejudice the attenuation.

Naturally any glazing [and vents if required] providing similar or better attenuation, would also be appropriate.

7.0 GLAZING AND VENTILATION SPECIFICATION

The glazing and ventilation of the following performances shown in Table 4 [or similar and approved] should achieve the target internal noise levels.

	Octave Band Centre Frequency [Hz]				
	125	250	500	1k	2k
Glazing - Rear	26	27	34	40	38
Vents - Rear	45	42	36	40	43
Glazing - Elsewhere	31	38	42	46	50
Vents - Elsewhere	47	46	49	56	66

Table 4: Element Sound Reduction Indices [dB]

We have assumed that the ventilation will either be Approved Document F “System 3” with vents as indicated, or “System 4” with no vents, in which case the internal levels are slightly over-predicted. In either instance the ventilation system should designed do not allow significant noise to enter from the outside, either because of the system's attenuation or because it vents to/from a quiet façade or location.

APPENDIX 1

EXPLANATION OF ACOUSTIC TERMS

The dB or the decibel, is the unit of noise. The number of decibels or the level, is measured using a sound level meter. It is common for the sound level meter to filter or 'weight' the incoming sound so as to mimic the frequency response of the human ear. Such measurements are designated **dB(A)**.

A doubling of the sound is perceived, by most people, when the level has increased by 10 dB(A). The least discernible difference is 2 dB(A). Thus most people cannot distinguish between, say 30 and 31 dB(A).

The Background level of noise is most commonly represented by the level which is exceeded for 90% of the time i.e. the LA90.

If a noise varies over time then the **equivalent continuous level, or LAeq**, is the notional constant level of noise which would contain the same amount of acoustic energy as the time varying noise.

The following table gives an approximate indication of the comparative loudness of various noises expressed in terms of the A weighted scale:

Source of noise	dB(A)	Nature of Noise
Inside Quiet bedroom at night	25-30	Very Quiet
Quiet office	40-45	
Rural background noise	35-45	
Normal conversational level	55-65	
Busy restaurant	65-75	
Inside suburban electric train	70-80	
Hand clap @ 1m	75-85	
HGV accelerating @ 5m away	85-90	Very Loud

APPENDIX 2

QUALIFICATIONS AND EXPERIENCE OF M.A. KENYON

My full name is Melville Alexander Kenyon. I am the principal of the firm of Martec Environmental Consultants Ltd, a consultancy company that specialises in environmental noise assessment and control. I graduated in 1982 with a Bachelor's degree in Engineering and subsequently a Master's degree in Environmental Acoustics. I have been a corporate member of the professional body for noise and vibration specialists, the Institute of Acoustics, since 1988, and have sat on the British Standards Committee dealing with noise in buildings [BS.8233:1999].

I have lectured at Liverpool John Moores University on the Diploma of Acoustics course and at Manchester Metropolitan University on their Environmental Health degree course.

The firm of Martec Environmental Engineering was formed in the 1970's and joined The Association of Noise Consultants in 1996. It is now known as Martec Environmental Consultants Ltd.

Since its formation, Martec has advised many groups of both residents and developers about the problems of noise and vibration in the environment.

APPENDIX 3

REFERENCES

- 1 "ProPG Planning and Noise - May 2017" The Association of Noise Consultants , Institute of Acoustics & Chartered Institute of Environmental Health.
- 2 BS.8233:2014 "Guidance on Sound Insulation and noise reduction for buildings."
- 3 Calculation of Road Traffic Noise (CRTN) – Department of Transport and the Welsh Office, HMSO,1988, ISBN 0-11-550847-3
- 4 Method for Converting the UK Road Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping – TRL/Cassella Stanger
<http://www.defra.gov.uk/environment/quality/noise/research/crtn/documents/noise-crtn-update2006.pdf>
- 5 BS EN 12354-3:2000 *Building Acoustics-Estimation of Acoustic Performance in buildings from the performance of elements. Part 3 Airborne Sound Insulation against Outdoor Sound.*
- 6 The Department of Transport "*Calculation of Railway Noise 1995*" - HMSO
- 7 BS4142:2014 "Methods for rating and assessing industrial and commercial sound"

APPENDIX 4

Predictions of Internal Noise

A4.1 F3 Living Room Daytime LAeq

BS EN 12354-Calcs		Use	Volume	Volume	55.5					
Version	4	length				Building Atten dBA (65.0 - 23.8)				
© 2017 Martec Environmental Consultants Ltd		width		RT	0.5					
& Acute Acoustics Ltd		height		Octave Band Centre Frequency [Hz]					dBA	
				125	250	500	1k	2k		
		Target External Noise Level (free field)								65.0
		Spectrum Shape Leq (Lin)								67.0
		Spectrum Matched to Target Level								65.0
Wall		Area m2	Element Sound Reduction Index [SRI]					Contrib		
Brick/block/cavity		12.0	41	45	45	54	58	16.7		
Drs/Wndws										
10 (20) 8.4A		9.2	31	38	42	46	50	21.8		
Roof Lights										
None		0.0	0	0	0	0	0	0.0		
Door										
None		0.0	0	0	0	0	0	0.0		
Roof										
None		0.0	0	0	0	0	0	0.0		
Vent Dn,e		# Vents								
Greenwood MA3051 Acoustic Wall vent		2.0	47	46	49	56	66	16.0		
								dBA		
		Internal SPL/dBLin	32.2	25.6	22.0	18.1	7.9	23.8		

A4.2 F3 Bedroom Daytime LAeq

BS EN 12354-Calcs		Use	Volume	Volume	37.2					
Version	4	length				Building Atten dBA (65.0 - 23.8)				
© 2017 Martec Environmental Consultants Ltd		width		RT	0.3					
& Acute Acoustics Ltd		height		Octave Band Centre Frequency [Hz]					dBA	
				125	250	500	1k	2k		
		Target External Noise Level (free field)								65.0
		Spectrum Shape Leq (Lin)								67.0
		Spectrum Matched to Target Level								65.0
Wall		Area m2	Element Sound Reduction Index [SRI]					Contrib		
Brick/block/cavity		12.0	41	45	45	54	58	16.2		
Drs/Wndws										
10 (20) 8.4A		10.8	31	38	42	46	50	22.0		
Roof Lights										
None		0.0	0	0	0	0	0	0.0		
Door										
None		0.0	0	0	0	0	0	0.0		
Roof										
None		0.0	0	0	0	0	0	0.0		
Vent Dn,e		# Vents								
Greenwood MA3051 Acoustic Wall vent		2.0	47	46	49	56	66	15.5		
								dBA		
		Internal SPL/dBLin	32.3	25.6	21.8	18.2	8.0	23.8		

A4.3 F3 Bedroom LMax

BS EN 12354-Calcs		Use	Volume	Volume	37.2				
Version 4		length					Building Atten dBA (85.0 - 43.9)		
© 2017 Martec Environmental Consultants Ltd		width		RT	0.3				
& Acute Acoustics Ltd		height		Octave Band Centre Frequency [Hz]					dBA
				125	250	500	1k	2k	
		Target External Noise Level (free field)							85.0
		Spectrum Shape Leq (Lin)							76.4
		Spectrum Matched to Target Level							85.0
Wall			Area m2	Element Sound Reduction Index [SRI]					Contrib
Brick/block/cavity			12.0	41	45	45	54	58	36.3
Drs/Wndws									
10 (20) 8.4A			10.8	31	38	42	46	50	42.2
Roof Lights									
None			0.0	0	0	0	0	0	0.0
Door									
None			0.0	0	0	0	0	0	0.0
Roof									
None			0.0	0	0	0	0	0	0.0
Vent Dn,e			# Vents						
Greenwood MA3051 Acoustic Wall vent			2.0	47	46	49	56	66	35.7
									dBA
			Internal SPL/dBLin	52.7	46.6	41.6	37.6	29.1	43.9

A4.4 F4 Studio LMax

BS EN 12354-Calcs		Use	Volume	Volume	104.5					
Version 4		length			Building Atten dBA (85.0 - 40.2)					44.8
© 2017 Martec Environmental Consultants Ltd		width		RT	0.4					
© 2017 Martec Environmental Consultants Ltd		height		Octave Band Centre Frequency [Hz]					dBA	
				125	250	500	1k	2k		
		Target External Noise Level (free field)							85.0	
		Spectrum Shape Leq (Lin)							76.4	
		Spectrum Matched to Target Level							85.0	
Wall			Area m2	Element Sound Reduction Index [SRI]					Contrib	
Brick/block/cavity			12.0	41	45	45	54	58	33.1	
Drs/Wndws										
10 (20) 8.4A			9.2	31	38	42	46	50	38.3	
Roof Lights										
None			0.0	0	0	0	0	0	0.0	
Door										
None			0.0	0	0	0	0	0	0.0	
Roof										
None			0.0	0	0	0	0	0	0.0	
Vent Dn,e			# Vents							
Greenwood MA3051 Acoustic Wall vent			2.0	47	46	49	56	66	32.4	
									dBA	
			Internal SPL/dBLin	48.9	42.9	38.1	33.9	25.3	40.2	

A4.5 F5 Studio LAmx

BS EN 12354-Calcs		Use	Volume	Volume	88.9					
Version	4	length				Building Atten dBA (85.0 - 40.4)				
© 2017 Martec Environmental Consultants Ltd & Acute Acoustics Ltd		width		RT	0.4					
		height		Octave Band Centre Frequency [Hz]					dBA	
				125	250	500	1k	2k		
		Target External Noise Level (free field)							85.0	
		Spectrum Shape Leq (Lin)		74.2	73.9	71.9	73.3	69.3	76.4	
		Spectrum Matched to Target Level		82.8	82.5	80.5	81.8	77.9	85.0	
Wall		Area m2		Element Sound Reduction Index [SRI]					Contrib	
Brick/block/cavity		12.0		41	45	45	54	58	33.8	
Drs/Wndws										
10 (20) 8.4A		7.4		31	38	42	46	50	38.1	
Roof Lights										
None		0.0		0	0	0	0	0	0.0	
Door										
None		0.0		0	0	0	0	0	0.0	
Roof										
None		0.0		0	0	0	0	0	0.0	
Vent Dn,e		# Vents								
Greenwood MA3051 Acoustic Wall vent		2.0		47	46	49	56	66	33.1	
									dBA	
		Internal SPL/dBLin		48.8	43.1	38.3	33.9	25.3	40.4	

A4.6 F10 Studio LAmx

BS EN 12354-Calcs		Use	Volume	Volume	95.0					
Version	4	length				Building Atten dBA (85.0 - 41.7)				
© 2017 Martec Environmental Consultants Ltd & Acute Acoustics Ltd		width		RT	0.4					
		height		Octave Band Centre Frequency [Hz]					dBA	
				125	250	500	1k	2k		
		Target External Noise Level (free field)							85.0	
		Spectrum Shape Leq (Lin)		74.2	73.9	71.9	73.3	69.3	76.4	
		Spectrum Matched to Target Level		82.8	82.5	80.5	81.8	77.9	85.0	
Wall		Area m2		Element Sound Reduction Index [SRI]					Contrib	
Brick/block/cavity		12.0		41	45	45	54	58	33.5	
Drs/Wndws										
10 (20) 8.4A		12.9		31	38	42	46	50	40.2	
Roof Lights										
None		0.0		0	0	0	0	0	0.0	
Door										
None		0.0		0	0	0	0	0	0.0	
Roof										
None		0.0		0	0	0	0	0	0.0	
Vent Dn,e		# Vents								
Greenwood MA3051 Acoustic Wall vent		2.0		47	46	49	56	66	32.9	
									dBA	
		Internal SPL/dBLin		50.6	44.3	39.2	35.3	26.9	41.7	

A4.7 F11 Studio LMax

BS EN 12354-Calcs		Use	Volume	Volume	104.9					
Version	4	length					Building Atten dBA (85.0 - 42.6)		42.4	
© 2017 Martec Environmental Consultants Ltd & Acute Acoustics Ltd			width		RT	0.4				
			height		Octave Band Centre Frequency [Hz]					dBA
					125	250	500	1k	2k	
			Target External Noise Level (free field)							85.0
			Spectrum Shape Leq (Lin)							76.4
			Spectrum Matched to Target Level							85.0
Wall			Area m2	Element Sound Reduction Index [SRI]					Contrib	
Brick/block/cavity			12.0	41	45	45	54	58	33.0	
Drs/Wndws										
10 (20) 8.4A			19.9	31	38	42	46	50	41.7	
Roof Lights										
None			0.0	0	0	0	0	0	0.0	
Door										
None			0.0	0	0	0	0	0	0.0	
Roof										
None			0.0	0	0	0	0	0	0.0	
Vent Dn,e			# Vents							
Greenwood MA3051 Acoustic Wall vent			2.0	47	46	49	56	66	32.4	
									dBA	
			Internal SPL/dBLin	51.9	45.3	40.0	36.4	28.1	42.6	

A4.8 Fo11 Studio LMax

BS EN 12354-Calcs		Use	Volume	Volume	104.9					
Version	4	length					Building Atten dBA (85.0 - 42.6)			
© 2017 Martec Environmental Consultants Ltd			width		RT	0.4				
& Acute Acoustics Ltd			height		Octave Band Centre Frequency [Hz]					dBA
					125	250	500	1k	2k	
			Target External Noise Level (free field)							85.0
			Spectrum Shape Leq (Lin)							76.4
			Spectrum Matched to Target Level							85.0
Wall			Area m2	Element Sound Reduction Index [SRI]					Contrib	
Brick/block/cavity			12.0	41	45	45	54	58	33.0	
Drs/Wndws										
10 (20) 8.4A			19.9	31	38	42	46	50	41.7	
Roof Lights										
None			0.0	0	0	0	0	0	0.0	
Door										
None			0.0	0	0	0	0	0	0.0	
Roof										
None			0.0	0	0	0	0	0	0.0	
Vent Dn,e			# Vents							
Greenwood MA3051 Acoustic Wall vent			2.0	47	46	49	56	66	32.4	
									dBA	
			Internal SPL/dBLin	51.9	45.3	40.0	36.4	28.1	42.6	

A4.9 G5 Studio LMax

BS EN 12354-Calcs		Use	Volume	Volume	79.2				
Version	4	length				Building Atten dBA (85.0 - 40.1)			44.9
© 2017 Martec Environmental Consultants Ltd			width	RT	0.4				
© 2017 Martec Environmental Consultants Ltd			height	Octave Band Centre Frequency [Hz]					dBA
				125	250	500	1k	2k	
			Target External Noise Level (free field)						85.0
			Spectrum Shape Leq (Lin)	74.2	73.9	71.9	73.3	69.3	76.4
			Spectrum Matched to Target Level	82.8	82.5	80.5	81.8	77.9	85.0
Wall			Area m2	Element Sound Reduction Index [SRI]					Contrib
Brick/block/cavity			12.0	41	45	45	54	58	34.3
Drs/Wndws									
10 (20) 8.4A			5.5	31	38	42	46	50	37.3
Roof Lights									
None			0.0	0	0	0	0	0	0.0
Door									
None			0.0	0	0	0	0	0	0.0
Roof									
None			0.0	0	0	0	0	0	0.0
Vent Dn,e			# Vents						
Greenwood MA3051 Acoustic Wall vent			2.0	47	46	49	56	66	33.6
									dBA
			Internal SPL/dBLin	48.3	42.9	38.3	33.7	24.8	40.1

A4.10 F19 Studio LMax

BS EN 12354-Calcs		Use	Volume	Volume	95.0					
Version	4	length			Building Atten dBA (75.0 - 40.4)					34.6
© 2017 Martec Environmental Consultants Ltd			width	RT	0.4					
& Acute Acoustics Ltd			height	Octave Band Centre Frequency [Hz]					dBA	
				125	250	500	1k	2k		
			Target External Noise Level (free field)						75.0	
			Spectrum Shape Leq (Lin)	63.3	60.9	58.0	60.2	56.2	63.3	
			Spectrum Matched to Target Level	75.1	72.6	69.7	72.0	67.9	75.0	
Wall			Area m2	Element Sound Reduction Index [SRI]					Contrib	
Brick/block/cavity			12.0	41	45	45	54	58	23.5	
Drs/Wndws										
10/12/6_double_glazing			12.2	26	27	34	40	38	38.7	
Roof Lights										
None			0.0	0	0	0	0	0	0.0	
Door										
None			0.0	0	0	0	0	0	0.0	
Roof										
None			0.0	0	0	0	0	0	0.0	
Vent Dn,e			# Vents							
Passivent TVALdB 450 Window Frame vent			2.0	45	42	36	40	43	35.3	
									dBA	
			Internal SPL/dBLin	47.3	43.9	36.9	34.2	29.9	40.4	

A4.11F19 Studio LAeq

BS EN 12354-Calcs		Use	Volume	Volume	95.0						
Version	4	length								Building Atten dBA (75.0 - 40.4)	34.6
© 2017 Martec Environmental Consultants Ltd		width		RT	0.4						
& Acute Acoustics Ltd		height		Octave Band Centre Frequency [Hz]							dBA
				125	250	500	1k	2k			
		Target External Noise Level (free field)								75.0	
		Spectrum Shape Leq (Lin)		63.3	60.9	58.0	60.2	56.2		63.3	
		Spectrum Matched to Target Level		75.1	72.6	69.7	72.0	67.9		75.0	
Wall			Area m2	Element Sound Reduction Index [SRI]					Contrib		
Brick/block/cavity			12.0	41	45	45	54	58		23.5	
Drs/Wndws											
10/12/6_double_glazing			12.2	26	27	34	40	38		38.7	
Roof Lights											
None			0.0	0	0	0	0	0		0.0	
Door											
None			0.0	0	0	0	0	0		0.0	
Roof											
None			0.0	0	0	0	0	0		0.0	
Vent Dn,e			# Vents								
Passivent TVALdB 450 Window Frame vent			2.0	45	42	36	40	43		35.3	
									dBA		
		Internal SPL/dBLin		47.3	43.9	36.9	34.2	29.9		40.4	