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PROJECT TECHNICAL MEMORANDUM

Our Ref : 26756
Date : 18 December 2020
Issued By : Michael Hartley
Issued To : Carey Gorgees (Chroma)

STORE STREET, MANCHESTER PLANNING CONDITION 15 DISCHARGE NOTE

1.0 Introduction

Planning condition 15 requests that evidence of the noise mitigation measures to ensure internal ambient noise levels in apartments satisfy agreed limits be submitted to the local planning authority. The condition is as below with relevant text highlighted in bold.

15. Before the development commences a scheme for acoustically insulating the proposed residential accommodation against noise from Store Street and the local transport network shall be submitted to and approved in writing by the City Council as local planning authority. There may be other actual or potential sources of noise which require consideration on or near the site, including any local commercial/industrial premises. The approved noise insulation scheme shall be completed before any of the dwelling units are occupied.

Noise survey data must include measurements taken during a rush-hour period and night time to determine the appropriate sound insulation measures necessary. The following noise criteria will be required to be achieved:

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

Upon completion of the development and before first occupation of the residential units, a verification report will be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that the internal noise criteria has been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the internal noise criteria.



2.0 Agreed Acoustic Criteria

The Hann Tucker Acoustic Design Report 26756/ADR1 dated 02 December 2020 presented specifications and design guidance for living room and bedroom facades using baseline noise survey data (obtained by Hann Tucker Associates Ref: HT:26756/NIA1 Rev3 12 February 2020).

Following liaison with Sue Jones of MCC, it was suggested that consideration for the nearby Presbar Diecasting factory rooftop plant should be assessed. Noise data of the rooftop plant was measured and presented in the Fisher Acoustics report in relation to the adjacent Oxygen development (cdn/17/0463 and ES Chapter 9 of 110276/FO/2015). It was deemed acceptable to utilise this data within our assessment in order to show compliance with the MCC criteria.

3.0 Existing Noise Levels

3.1 Baseline Noise Survey

Early stage advice for glazing specification types is presented in the Hann Tucker Associates Planning Report (Ref:26756/NIA1 dated 12 February 2020) alongside measured external noise levels of the general surrounding and specific measurements of tram noise and are summarised below.

3.2 Measurement Positions

Automated free-field noise level measurements were undertaken at 2No positions on site, as described/illustrated below.

Position	Description
1	Unattended free-field measurement overlooking Store Street, microphone approx. 3 metres above ground.
2	Unattended free-field measurement overlooking the canal tow path at the south of the site, microphone approx. 3 metres above ground.



Site Plan (© maps.google.co.uk)

3.3 Results

The results of the automated survey have been plotted on Time History Graphs 26756/TH1 - TH2 enclosed. These graphs present the 15 minute A-weighted (dBA) L_{90} , L_{eq} and L_{max} levels at each position throughout the duration of the survey.

A summary of the results from the automated noise survey, as used to inform subsequent assessments against current guidelines, is presented in the table below. L_{A90} values represent the 'typical lowest' 15-minute level (observed) and $L_{A_{fmax}}$ values are taken as the 'mean 10th highest' 5-minute value. All results are free-field levels.

Position	Daytime (07:00 – 23:00 hrs)		Night-time (23:00 – 07:00 hrs)		
	$L_{Aeq,16hr}$	L_{A90}	$L_{Aeq,8hr}$	L_{A90}	$L_{A_{fmax},5min}$
1	70 dB	42 dB	67 dB	40 dB	84 dB
2	62 dB	46 dB	56 dB	43 dB	71 dB

3.4 Industrial Noise Levels

The following table presents the highest measured L_{Aeq} noise level of the rooftop plant from the Fischer Acoustics report. This shall inform our assessment of external noise intrusion from Presbar Die-casting (L_{Aeq} to bedrooms).



Measured Maximum External Sound Level (dB) at Octave Band Centre Frequency (Hz)						Broadband Maximum Noise Level (dBA)
125	250	500	1k	2k	4k	
59	56	53	58	59	42	63

The above noise levels were taken at a height of 16 metres and a distance of approximately 20m from Presbar. This measurement position is approximately 40m north east of the development. No distance loss has been applied to the Fisher Acoustic measurement data as to inform a worst-case assessment.

4.0 Design Guidance

4.1 Planning Input

Early stage advice for glazing specification types is presented in the Hann Tucker Associates Planning Report and listed below.

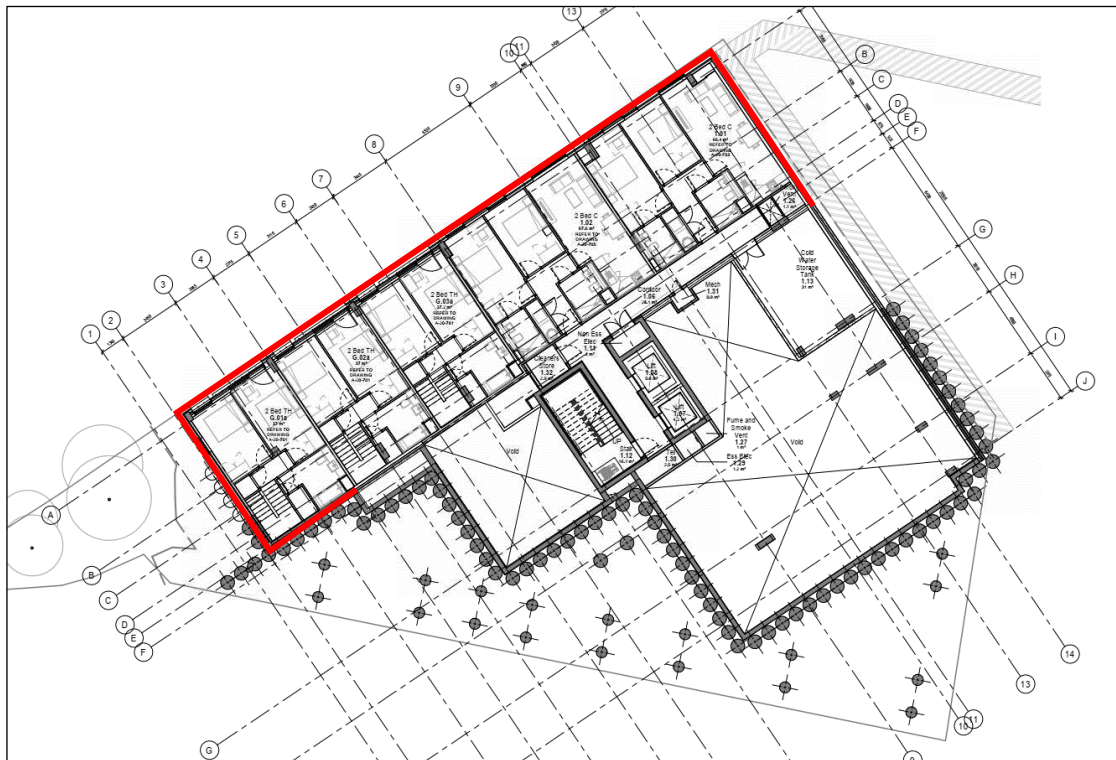
Type		Façade Element	Preliminary Minimum Sound Reduction Specification
A	Red	Window	38 dB $R_w + C_{tr}$
B	Orange	Window	35 dB $R_w + C_{tr}$
C	Green	Window	27 dB $R_w + C_{tr}$

4.2 Design Stage Input

The planning stage specifications were preliminary, providing only broadband specifications in order to demonstrate the suitability of the scheme for residential use. More detailed and accurate octave band calculations were undertaken at design stage in order to determine more refined specifications for tender and are defined in the table below:

Type		Example Configuration (glass / airspace / glass)	Minimum Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)						Overall (dB) $R_w + C_{tr}$ (Guidance only)
			125	250	500	1k	2k	4k	
A	Red	10 mm / 16 mm / 8.8 mm	28	34	40	43	45	47	38
B	Orange	10 mm / 16 mm / 6.4 mm	26	28	37	40	42	45	35
C	Blue	10 mm / 16 mm / 6 mm	24	25	32	37	37	40	32
D	Green	6 mm / 16 mm / 6 mm	22	25	30	32	34	34	29

The following sketches illustrate the extent of the above Glazing Type Zones determined during the design stage input on the scheme.



Glazing Type Zones Levels 00 - 01



Glazing Type Zones Levels 02 - 03



Glazing Type Zones Levels 04 - 05



Glazing Type Zones Levels 06 - 07



Glazing Type Zones Levels 08 - 10

5.0 Summary of Octave Band Calculations

The tables below summarise the findings of our noise intrusion calculations, and present the calculated internal noise level with reference to the agreed internal noise criteria as a broadband value. Further octave band calculations are presented in Sections 5.1.1 to 5.1.4.

Red Glazing Zone

Dwelling	Daytime $L_{Aeq,16hr}$	Night-time $L_{Aeq,8hr}$	Night-time L_{Amax}
Worst Case External Incident Noise Level	70 dB	67 dB	84 dB
Resultant Internal Noise Level	28 dB	25 dB	45 dB

Orange Glazing Zone

Dwelling	Daytime L _{Aeq,16hr}	Night-time L _{Aeq,8hr}	Night-time L _{Afmax}
Worst Case External Incident Noise Level	69 dB	66 dB	81 dB
Resultant Internal Noise Level	29 dB	29 dB	44 dB

**Blue Glazing Zone**

Dwelling	Daytime $L_{Aeq,16hr}$	Night-time $L_{Aeq,8hr}$	Night-time L_{Amax}
Worst Case External Incident Noise Level	67 dB	65 dB	78 dB
Resultant Internal Noise Level	30 dB	28 dB	44 dB

Green Glazing Zone

Dwelling	Daytime $L_{Aeq,16hr}$	Night-time $L_{Aeq,8hr}$	Night-time L_{Amax}
Worst Case External Incident Noise Level	62 dB	63 dB	71 dB
Resultant Internal Noise Level	29 dB	30 dB	41 dB

The calculations from our assessment indicate the proposed glazing systems provide the adequate sound reduction against road traffic noise and industrial noise and provide internal noise levels below the limits set by MCC for all glazing configurations.

5.1 Example Noise Intrusion Calculations

We have calculated the resultant internal noise level within habitable rooms using the following equation (Equation G.1) contained within BS 8233:2014. For brevity we have presented the worst case habitable room calculations, detailed calculations are available for all room types upon request.:

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{-\frac{D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{-\frac{R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{-\frac{R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{-\frac{R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

To inform our worst case assessment we have looked at the highest external Daytime $L_{Aeq,16hr}$ and Night-time $L_{Aeq,8hr}$ and L_{Amax} (with associated octave band spectra) and calculated the noise break in through the worst affected apartment.

The parameters used within our assessment for bedrooms are presented below, for reference.

Term	Derivation	Bedrooms (m ²)	Living Rooms (m ²)
S_f	Façade area	6.2	19.2
S_{wi}	Window area	2.9	5.5
S_{ew}	External wall area	3.4	13.7
S	Floor area of dwelling	11.6	27.2

Based on the above, the following sections present our BS 8233:2014 assessment for worst case daytime $L_{Aeq,16hr}$, night-time $L_{Aeq,8hr}$, and night-time L_{Amax} noise levels.

**5.1.1 Detailed Calculation (Red Zone)****Daytime $L_{Aeq,16hr}$**

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	63	62	65	68	61	54	70 dB $L_{Aeq,16hr}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	28	34	40	43	45	47	38 dB $R_w + C_{tr}$
Equivalent absorption area, A	21	21	21	21	21	21	21
Internal noise level, $L_{eq,2}$	36	28	25	24	15	4	28 dB $L_{Aeq,16hr}$

Night-time $L_{Aeq,8hr}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	60	59	62	65	58	51	67 dB $L_{Aeq,8hr}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	28	34	40	43	45	47	38 dB $R_w + C_{tr}$
Equivalent absorption area, A	9	9	9	9	9	9	9
Internal noise level, $L_{eq,2}$	33	25	21	21	12	1	25 dB $L_{Aeq,8hr}$

Night-time $L_{A,max}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	80	80	82	85	78	73	84 dB $L_{A,max}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	28	34	40	43	45	47	38 dB $R_w + C_{tr}$
Equivalent absorption area, A	9	9	9	9	9	9	9
Internal noise level, $L_{eq,2}$	53	45	42	40	32	23	45 dB $L_{A,max}$

5.1.2 Detailed Calculation (Blue Zone)**Daytime $L_{Aeq,16hr}$**

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	62	61	64	67	60	53	69 dB $L_{Aeq,16hr}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (specification)	26	28	37	40	42	45	35 dB $R_w + C_{tr}$
Equivalent absorption area, A	21	21	21	21	21	21	21
Internal noise level, $L_{eq,2}$	36	32	26	25	16	5	29 dB $L_{Aeq,16hr}$

**Night-time $L_{Aeq,8hr}$**

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	59	58	61	64	57	50	66 dB $L_{Aeq,8hr}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	26	28	37	40	42	45	35 dB $R_w + C_{tr}$
Equivalent absorption area, A	9	9	9	9	9	9	9
Internal noise level, $L_{eq,2}$	33	29	22	22	13	2	26 dB $L_{Aeq,8hr}$

Night-time $L_{A,max}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	77	77	79	82	75	70	81 dB $L_{A,max}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	26	28	37	40	42	45	35 dB $R_w + C_{tr}$
Equivalent absorption area, A	9	9	9	9	9	9	9
Internal noise level, $L_{eq,2}$	51	48	41	40	31	22	44 dB $L_{A,maxr}$

5.1.3 Detailed Calculation (Orange Zone)**Daytime $L_{Aeq,16hr}$**

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	60	59	62	65	58	51	67 dB $L_{Aeq,16hr}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	24	25	32	37	37	40	32 dB $R_w + C_{tr}$
Equivalent absorption area, A	21	21	21	21	21	21	21
Internal noise level, $L_{eq,2}$	36	33	28	26	18	7	30 dB $L_{Aeq,16hr}$

Night-time $L_{Aeq,8hr}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	58	57	60	63	56	49	65 dB $L_{Aeq,8hr}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	24	25	32	37	37	40	32 dB $R_w + C_{tr}$
Equivalent absorption area, A	9	9	9	9	9	9	9
Internal noise level, $L_{eq,2}$	34	31	26	24	16	5	28 dB $L_{Aeq,8hr}$

**Night-time $L_{A,max}$**

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	74	74	76	79	72	67	78 dB $L_{A,max}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	24	25	32	37	37	40	32 dB $R_w + C_{tr}$
Equivalent absorption area, A	9	9	9	9	9	9	9
Internal noise level, $L_{eq,2}$	49	47	42	39	32	26	44 dB $L_{A,max}$

5.1.4 Detailed Calculation (Green Zone)**Daytime $L_{Aeq,16hr}$**

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	60	59	59	58	53	51	62 dB $L_{Aeq,16hr}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	22	25	30	32	34	34	29 dB $R_w + C_{tr}$
Equivalent absorption area, A	21	21	21	21	21	21	21
Internal noise level, $L_{eq,2}$	37	32	27	23	16	13	31 dB $L_{Aeq,16hr}$

Night-time $L_{Aeq,8hr}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	59	56	53	58	59	42	63 dB $L_{Aeq,16hr}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	22	25	30	32	34	34	29 dB $R_w + C_{tr}$
Equivalent absorption area, A	9	9	9	9	9	9	9
Internal noise level, $L_{eq,2}$	37	30	22	24	23	5	29 dB $L_{Aeq,16hr}$

Night-time $L_{A,max}$

Description	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	67	67	69	72	65	60	71 dB $L_{Aeq,16hr}$
External wall, R_{ew}	33	42	45	50	50	55	50 dB $R_w + C_{tr}$
Glazing, R (Specification)	22	25	30	32	34	34	29 dB $R_w + C_{tr}$
Equivalent absorption area, A	9	9	9	9	9	9	9
Internal noise level, $L_{eq,2}$	45	41	38	38	29	23	41 dB $L_{Aeq,16hr}$



5.2 Assessment of Industrial Noise Levels

Façade performance specifications for dwellings in the Red, Blue and Orange zones as shown in Section 4.2, are specified based on an external noise level that is higher than what would be expected from the nearby Presbar industrial unit. For Dwellings in the Green zone the specification has been based on the higher previously measured industrial noise levels. We have summarised our calculations of external night-time noise levels within dwellings in these zones in Section 5.0, along with a detailed example of the calculations in Section 5.1 and section 5.1.2.

Source	Façade Zone	Incident Noise Level (dB)
Industrial Noise	Orange/Blue	63 dB L_{Aeq}
Environmental Noise	Orange/Blue	65 dB L_{Aeq} (78dB L_{Amax})

The industrial noise level, BS 4142, is lower than the incident environmental noise level at the worst affected facades (orange/blue zones). In accordance with ProPG, where industrial noise contributes but does not dominate the noise climate, BS 8233 internal noise levels should apply. This is the case here, and thus the façade acoustic performance requirements should be driven by the environmental (dominant) noise. No specific assessment/mitigation solution to BS 4142 for the industrial noise source should be required.

The calculations from our assessment indicate the minimum glazing specifications provide adequate sound reduction against external noise to ensure the internal noise criteria set out in Planning Condition 15 are achieved. As such, the minimum glazing specifications are considered in-line with the requirements of Planning Condition 15.

6.0 Summary

Based on our detailed environmental noise survey and previous industrial noise survey data by others, the building envelope specifications should be suitable to achieve the required internal noise criteria as set out in Planning Condition 15.

For and on behalf of
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