

Technical Note – AO Arena Noise, Boddingtons

November 26, 2025

Our Ref: CSGA-C2164-TN03 – Boddingtons, Planning Condition 23a – AO Arena Event Noise

Client: Graham Construction

Introduction

A review of noise break-in has been carried out by Cundall and is detailed in the Planning Stage Noise Impact Assessment Report (*Ref: BODM-CDL-XX-XXRP-AS-45200 P02 dated 16th August 2023*). The report details the criteria in terms of ProPG, British Standard guidance BS8233:2014 and Manchester City Council (MCC) entertainment noise requirements.

The Cundall report details the noise surveys and assessment of noise impact on the development from all measured sources for compliance with internal ambient noise level criteria.

The site is located close to Great Ducie Street and the AO arena and is therefore potentially subject to entertainment noise and significant road traffic noise. The Cundall assessment concludes that entertainment noise from the AO Arena is below the level of traffic noise at the development and therefore predicts it will meet MCC criteria for entertainment noise.

Concerns have been raised by the Local Authority EHO, that the noise survey and assessment of entertainment noise from the AO Arena by Cundall is inadequate, due to the type of event surveyed.

To address these concerns, CSG Acoustics have undertaken two new noise surveys and a new noise break-in assessment from the AO Arena.

This letter details the results of the noise surveys and subsequent noise break-in review of entertainment noise affecting the new Boddingtons development.

This technical note is supplementary to the first technical note (C2164-TN01) which addresses noise break-in and internal ambient noise levels from all sources, except the AO Arena noise.

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1 Manchester City Council Internal Noise Criteria – Entertainment Noise

Manchester City Council have imposed a Planning Condition (23a) on the Boddingtons development, which relates to low frequency entertainment noise.

The specific wording of the condition is as follows:

‘Where applicable (entertainment/music): Additionally, where entertainment noise is a factor in the noise climate the sound insulation scheme shall be designed to achieve internal noise levels in the 63Hz and 125Hz octave band centre frequency bands so as not to exceed (in habitable rooms) 47db and 41 dB respectively.’

The following table presents the event noise levels to be achieved within the habitable rooms (Bedrooms and Living Rooms) of the Boddingtons development, specifically relating to entertainment noise.

Table 1.1: Internal Noise Level Criteria – Entertainment/Music Noise

Space	Internal Noise Level from AO Arena Events, $L_{eq, 5min}$	
	Octave Band Centre Frequency, Hz	
	63Hz	125Hz
Habitable Room (Bedrooms and Living Rooms)	47 dB	41 dB

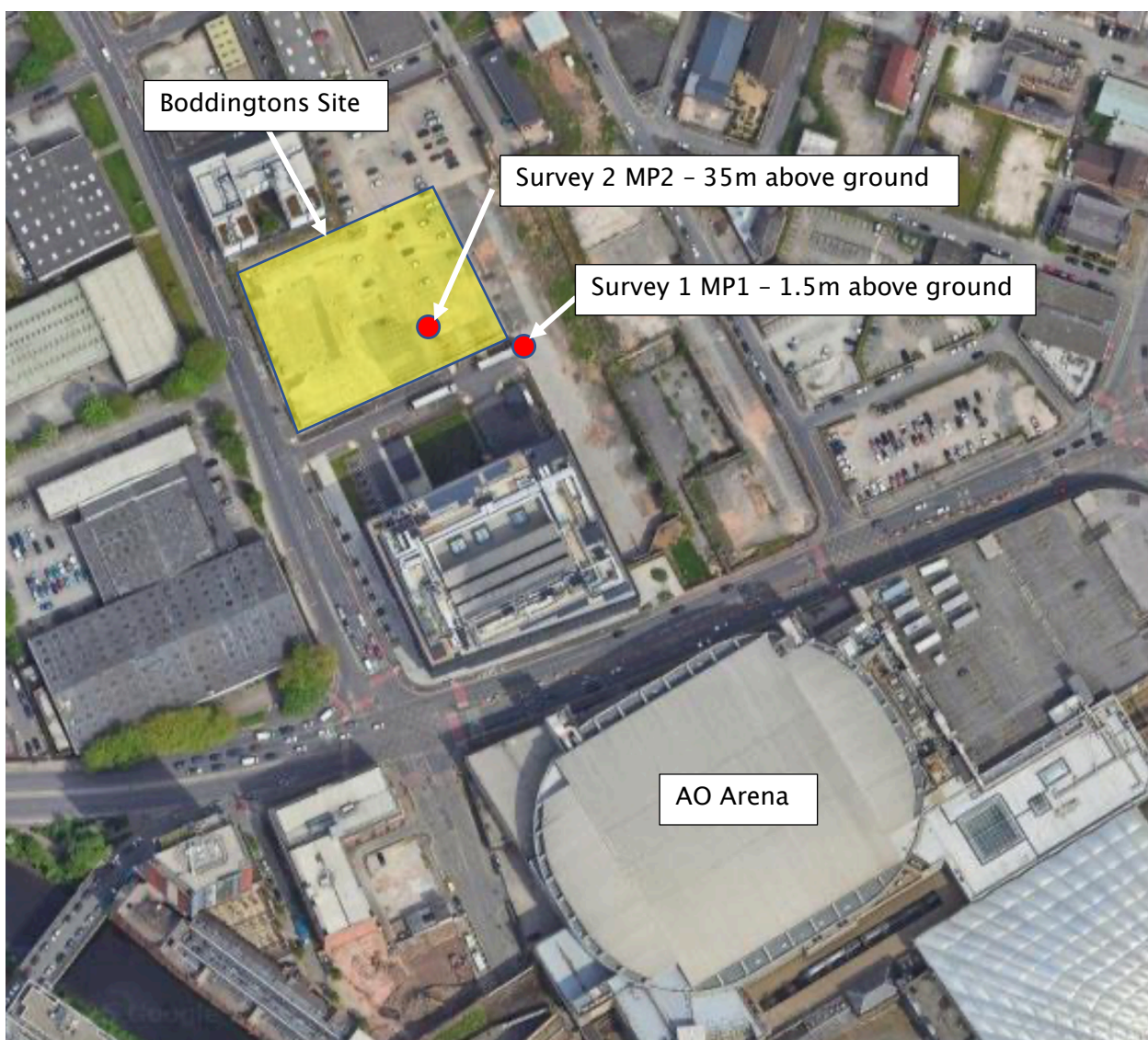
2 Noise Survey – AO Arena Noise Levels

Noise from the AO Arena has been measured by CSG Acoustics on 17th October from 8:22pm – 9:27pm during ‘Busted vs McFly’ gig (Survey 1) and also on the 16th November from 8:25pm–10:10pm during ‘Offspring’ gig (Survey 2). The worst-case noise levels from the two concerts have been used on our assessment and are considered suitable as assessment of noise levels from the AO Arena.

The measurements were taken at 1.5m above the ground and also approximately 30m above the ground with line of sight to the AO Arena roof. The measurements taken at height by mounting a sound level meter on the onsite crane, as marked below (MP2).

Measurements were taken in 5-minute periods, in line with MCC criteria.

Figure 2.1: Noise Measurement Positions



The equipment used for the survey was as follows:

Table 2.1: Equipment (Survey 1)

Equipment	Model	Serial No.	Certificate No.	Calibration Date
Class 1 SLM	01dB SOLO	60672	07212/1	09/05/2025
Microphone	01dB – MCE212	80836		
Preamplifier	01dB – PRE21S	13541		
Calibrator	Cirrus CR:511E	33927	07367/1	20/08/2025

Table 2.2: Equipment (Survey 2)

Equipment	Model	Serial No.	Certificate No.	Calibration Date
Class 1 SLM	01dB FUSION	10816	07211/1	01/05/2025
Microphone	GRAS 1/2" - 40CD	383040		
Preamplifier	01dB - PRE22	10959		
Calibrator	Cirrus CR:511E	33927	07367/1	20/08/2025

Both noise surveys were fully attended and the weather was suitable for noise measurement being dry with only a light breeze.

Noise Survey Results

Table 2.3: Noise Measurement Results (Survey 1, AO Arena – Busted vs McFly)

Location	Time	Noise Level from AO Arena Events, L_{eq} , 5min	
		Octave Band Centre Frequency, Hz	
		63Hz	125Hz
MP1 Boddington Site As Shown in Figure 2.1	20:22	70.5	55.0
	20:27	67.9	54.5
	20:32	67.7	54.1
	20:37	66.2	51.7
	20:47	70.3	54.9

	20:57	68.3	57.0
	21:02	64.7	52.9
	21:07	63.2	53.0
	21:12	67.3	52.9
	21:17	69.2	54.6
	21:22	65.1	57.3

Table 2.4: Noise Measurement Results (Survey 2, AO Arena – Offspring)

Location	Time	Noise Level from AO Arena Events, L_{eq} , 5min	
		Octave Band Centre Frequency, Hz	
		63Hz	125Hz
MP2 Boddingtons Site overlooking AO Arena roof As Shown in Figure 2.1	20:25	66.9	55.9
	20:30	63.8	58.5
	20:35	65.5	56.9
	20:40	59.6	54.7
	20:45	63.1	55
	20:50	61.4	53.4
	20:55	64.4	53.9
	21:00	65.6	54.8
	21:05	66.6	54.9
	21:10	65.8	55.5
	21:15	66	55.8
	21:20	65.9	54.7
	21:25	66.9	55.8

Location	Time	Noise Level from AO Arena Events, $L_{eq, 5min}$	
		Octave Band Centre Frequency, Hz	
		63Hz	125Hz
	21:30	62.7	54.4
	21:35	62.7	54.3
	21:40	65.1	55.5
	21:45	65.5	54.7
	21:50	67.2	56.4
	21:55	63.6	53.6
	22:00	60.3	53.8
	22:05	62.5	54.3

Based on the above measured noise data a 3D CadnaA noise model has been verified and façade incident noise levels ($L_{Aeq, 5mins}$) have been predicted, allowing internal noise levels and subsequent façade sound insulation requirements to be specified.

3 AO Arena Event Noise Break-in Assessment

Noise break-in levels from the AO Arena event have been assessed against internal ambient noise level criteria stated in the MCC Planning Condition (Table 1.1).

The noise levels are assessed in the daytime period, there is no change to the night-time strategy, with the assumption that AO Arena events do not occur during the night-time period (23:00–07:00).

Façade Incident Noise Levels – Noise Modelling

The site and surrounding buildings have been modelled in CadnaA software using large horizontal and vertical areas sources to represent the noise breakout from the AO Arena roof and vertical cladding.

The worst-case highest level predicted is at the top floor of the nearest block (Block B) and is 64dBA (77dB @63Hz and 66 dB @ 125Hz). These levels are significantly higher than assessed in the original planning report by Cundall.

The following figures show the predicted worse case incident $L_{Aeq, 5mins}$ at the Boddingtons site due to the AO Arena event.

Figure 3.1: Noise Model Overview

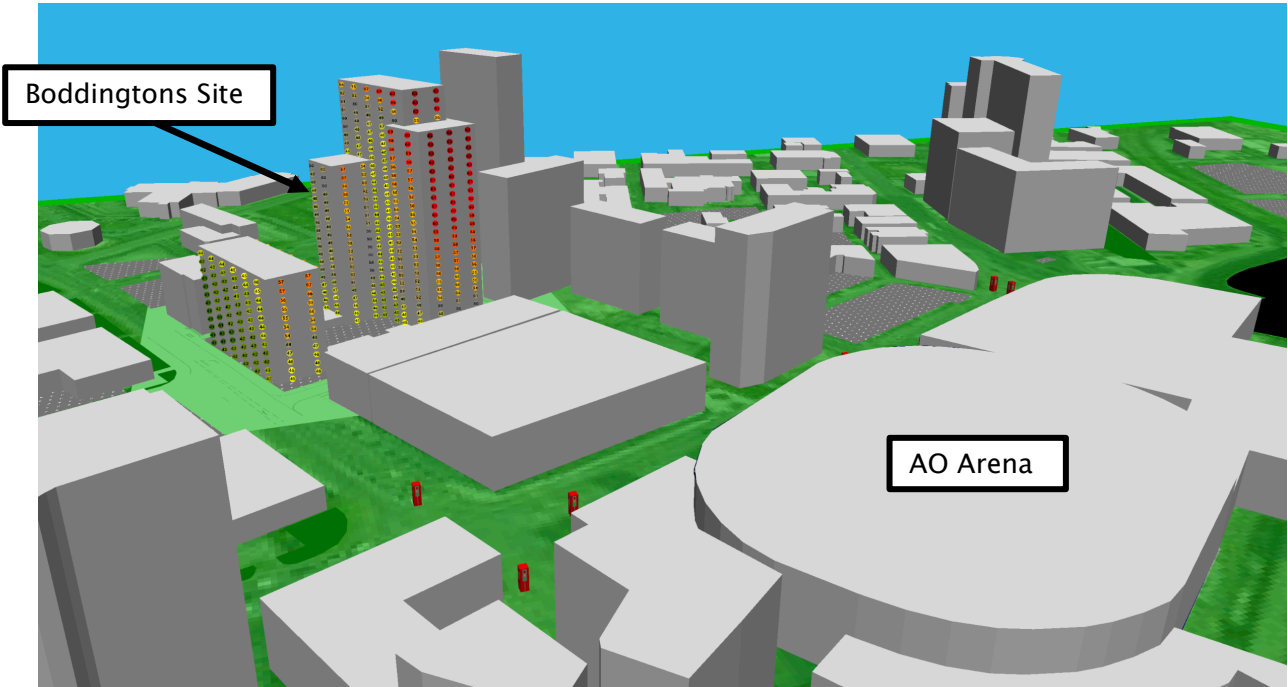


Figure 3.2: Boddingtons Facade Noise Levels, $L_{Aeq,5mins}$ (dB) – South West View

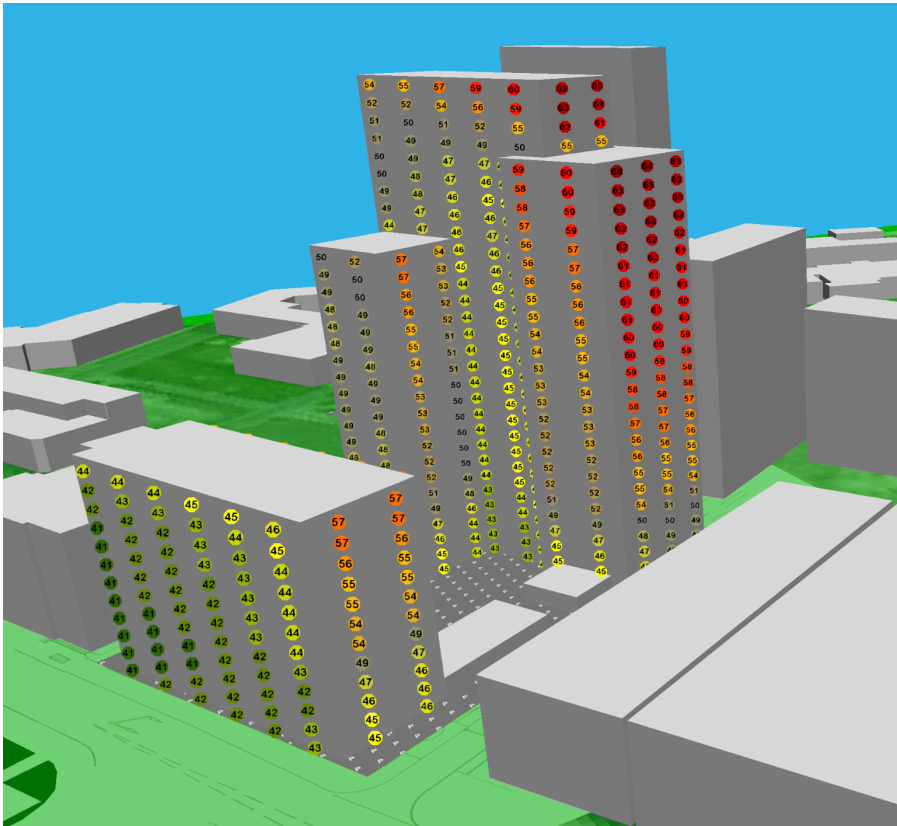
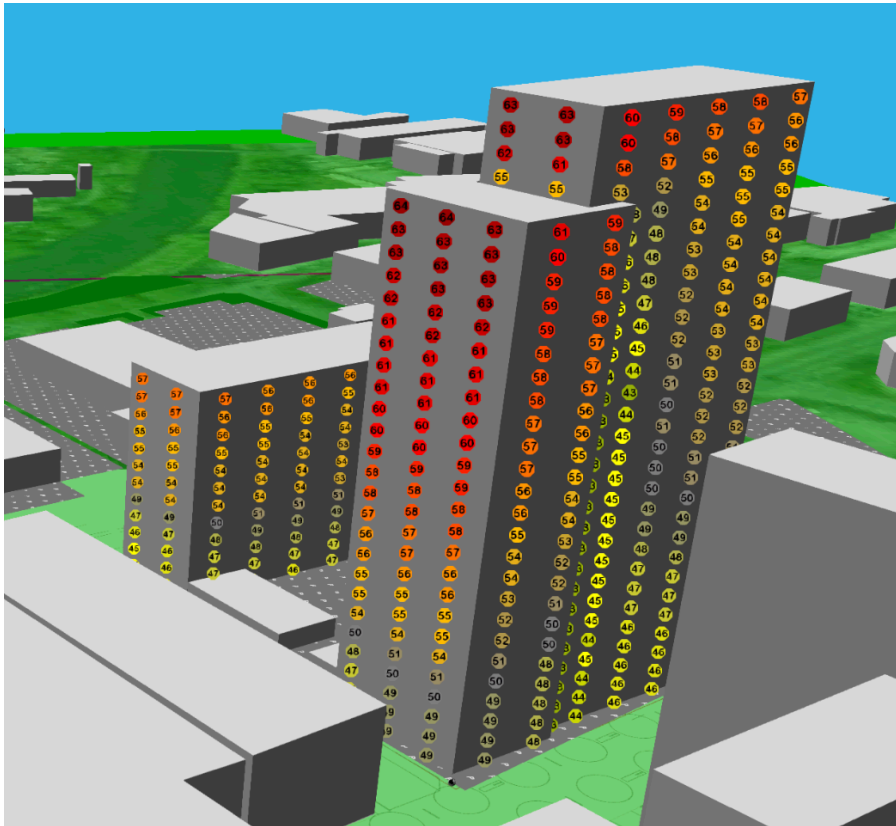


Figure 3.3: Boddingtons Facade Noise Levels, $L_{Aeq,5mins}$ (dB) – South East View



The following table details the worst-case noise levels predicted at the Boddington B site (Block B upper floors).

Table 3.1: Worst Case Façade Incident Noise Levels

Location	Noise Level from AO Arena Events, Leq, 5min (dB)		dBA
	Octave Band Centre Frequency, Hz		
	63Hz	125Hz	
Block B (Top Floor – South Facing)	77	66	64

Proposed Glazing and Noise Break-in Assessment

There are three types of glazing currently proposed as detailed in Table 3.2 below. Further details and full specifications are appended to this technical note. All three proposed glazed units are a triple glazed configuration.

The data provided by the glazing supplier does not include 63Hz sound insulation performance, therefore INSUL software has been used to predict the performance in the 63Hz frequency band. The software predicts 26dB sound reduction at 63Hz for all three glazing configurations.

The following table details the proposed glazing types (As per LDG technical submittal dated 7/10/2025) and the predicted acoustic performance at low frequency.

Table 3.2: Glazing Types and Acoustic Performance

Glazing	Sound Reduction Indices (dB)		
	63Hz*	125Hz**	Rw**
G1 6.8mm Lam / (16mm gap 1) / 4mm / (16mm gap 2) / 6mm	26	17	39
G2 8.8mm Lam / (16mm gap 1) / 4mm / (16mm gap 2) / 6mm	26	25	43
G3 10.8mm Lam / (16mm gap 1) / 4mm / (16mm gap 2) / 6mm	26	21	41

*Predicted using INSUL

**Provided by glazing supplier

The internal noise level due to the AO Arena event has been predicted using the performance of the proposed glazing. It was found that type G1 (Rw 39) glazing is suitable for majority of the development and G2 is suitable for the higher floors of the Building B to protect against noise from the AO arena. The following Figures 3.4 to 3.6, show the required glazing specifications marked on the elevation drawings to achieve the Planning Condition requirements.

Note the following specification locations covers the facades shown and previous specification for all other facades detailed in Planning Stage Noise Impact Assessment Report (Ref: BODM-CDL-XX-XXRP-AS-45200 P02 dated 16th August 2023) still apply.

Calculations showing each glazing configuration and subsequent predicted internal level meeting the MCC Planning Condition requirements, is appended to this letter.

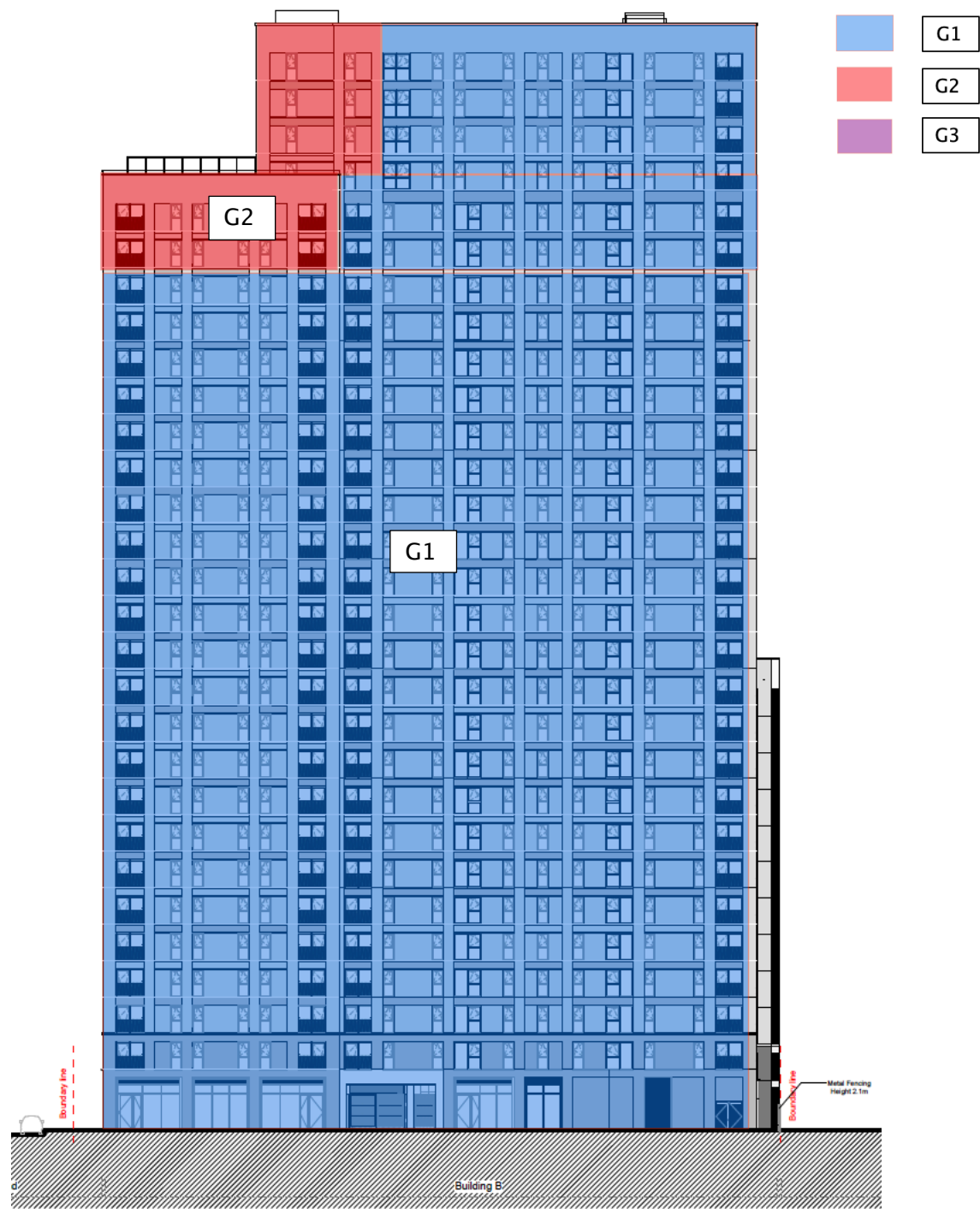
Figure 3.4: Glazing Requirements – South Facing (towards AO Arena)



Notes:

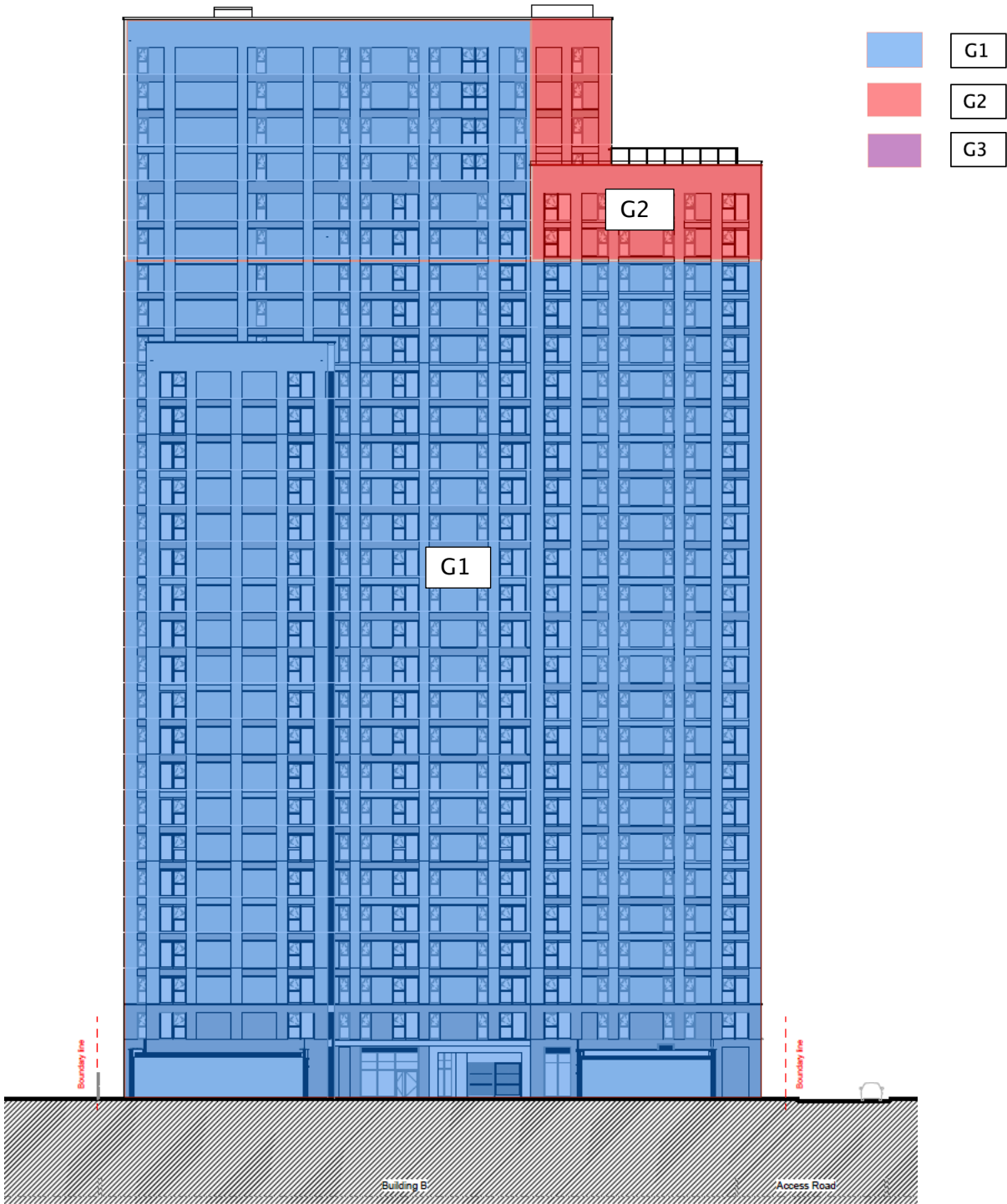
- 'Building A' glazing specification is suitable as currently specified in the Cundall report. It requires enhanced glazing due to road traffic noise from Ducie Street, not AO Arena noise. It is just shown above for clarity.
- See Table 3.2 for full low frequency glazing specification in Octave Bands.

Figure 3.5: Glazing Requirements – East Facing



See Table 3.2 for full low frequency glazing specification in Octave Bands.

Figure 3.6: Glazing Requirements – West Facing



See Table 3.2 for full low frequency glazing specification in Octave Bands

CSGA 8233 Noise Breakin Calculation**Block B Lower Floors (G1 Glazing)**

Façade Area (Typical Including Window)	9.6
Window Area (typical)	4.0
Area of Ceiling	0
Total Area	9.6
Room Vol	68.64

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Calculation Inputs		63	125	250	500	1000	2000	dB(A)
Source Noise Level (Day)	LAeq	73.5	62.5	58.5	54.5	58.5	53.5	60
Glazing (G1 Rw 39)	Rwi	26	17	31	37	47	43	
SFS System with 100mm Facing Brick	Rew	41	49	49	54	62	64	
Absorption Area		22	22	22	22	22	22	
Composite Performance Calc		63	125	250	500	1000	2000	
Glazing (G1 Rw 39)	Rwi	26	17	31	37	47	43	
SFS System with 100mm Facing Brick	Rew	41	49	49	55	55	60	
Composite Performance		-29.6	-20.8	-34.7	-40.7	-49.9	-46.7	
+10*LOG(S)		9.8	9.8	9.8	9.8	9.8	9.8	
-10*log(A)		-13.4	-13.4	-13.4	-13.4	-13.4	-13.4	
+3		3	3	3	3	3	4	
Internal Noise Level Prediction		43	41	23	13	8	0	26.1

CSGA 8233 Noise Breakin Calculation**Block B Upper Floors (G2 Glazing)**

Façade Area (Typical Including Window)	9.6
Window Area (typical)	4.0
Area of Ceiling	0
Total Area	9.6
Room Vol	68.64

CSG

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Calculation Inputs		63	125	250	500	1000	2000	dB(A)
Source Noise Level (Day)	LAeq	77.0	66.0	62.0	58.0	62.0	57.0	64
Glazing (G2 Rw 43)	Rwi	26	25	32	43	49	43	
SFS System with 100mm Facing Brick	Rew	41	49	49	54	62	64	
Absorption Area		22	22	22	22	22	22	
Composite Performance Calc		63	125	250	500	1000	2000	
Glazing (G2 Rw 43)	Rwi	26	25	32	43	49	43	
SFS System with 100mm Facing Brick	Rew	41	49	49	55	55	60	
Composite Performance		-29.6	-28.8	-35.7	-46.4	-51.5	-46.7	
+10*LOG(S)		9.8	9.8	9.8	9.8	9.8	9.8	
-10*log(A)		-13.4	-13.4	-13.4	-13.4	-13.4	-13.4	
+3		3	3	3	3	3	4	
Internal Noise Level Prediction		47	37	26	11	10	0	24.7

CSGA 8233 Noise Breakin Calculation**Block B Upper Floors (G3 Glazing)**

Façade Area (Typical Including Window)	9.6
Window Area (typical)	4.0
Area of Ceiling	0
Total Area	9.6
Room Vol	68.64

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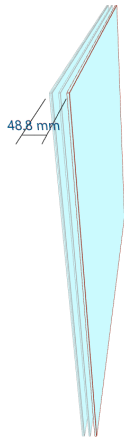
Calculation Inputs		63	125	250	500	1000	2000	dB(A)
Source Noise Level (Day)	L _{Aeq}	77.0	66.0	62.0	58.0	62.0	57.0	64
Glazing (G3 Rw 41)	R _{wi}	26	21	33	49	50	63	
SFS System with 100mm Facing Brick	R _{ew}	41	49	49	54	62	64	
Absorption Area		22	22	22	22	22	22	
Composite Performance Calc		63	125	250	500	1000	2000	
Glazing (G3 Rw 41)	R _{wi}	26	21	33	49	50	63	
SFS System with 100mm Facing Brick	R _{ew}	41	49	49	55	55	60	
Composite Performance		-29.6	-24.8	-36.7	-51.5	-52.2	-61.0	
+10*LOG(S)		9.8	9.8	9.8	9.8	9.8	9.8	
-10*log(A)		-13.4	-13.4	-13.4	-13.4	-13.4	-13.4	
+3		3	3	3	3	3	4	
Internal Noise Level Prediction		47	41	25	6	9	0	26.5

Sound Insulation Prediction (v10.0.3)

Program copyright Marshall Day Acoustics 2017 | Margin of error is generally within $R_w \pm 3$ dB

Date: 03/11/2025

Job Name:



R_w 42 dB

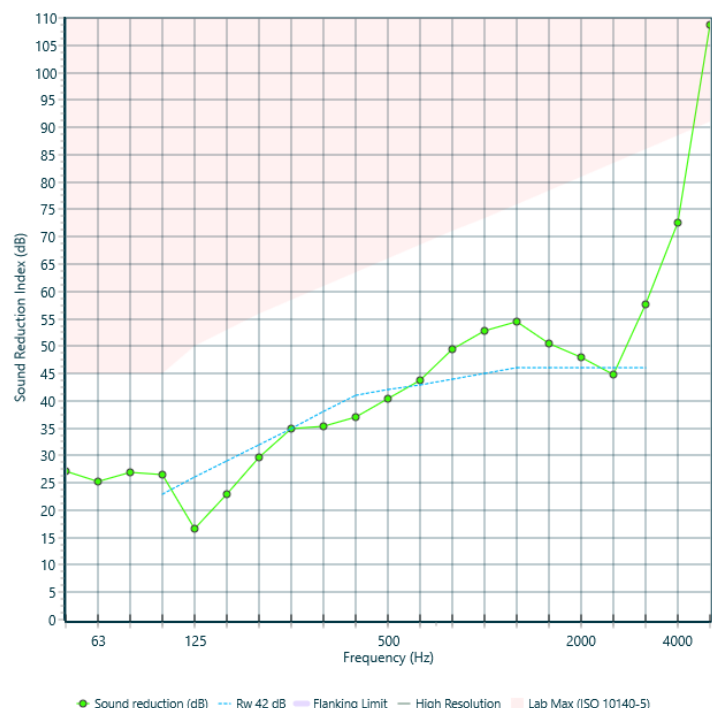
C -3 dB

Ctr -8 dB

System description

Pane 1 1 x 6.76 mm Laminated Glass (generic PVB)
Cavity Aluminium Frame (Generic type), argon: 16 mm
Pane 2 1 x 4 mm Glass
Cavity Aluminium Frame (Generic type), argon: 16 mm
Pane 3 1 x 6 mm Glass
Details Wave-based model, Panel Size 1.3 m x 1.5 m, Partition surface mass = 39.7 kg/m², Mass-air-mass resonant frequency = : 137 Hz, 277 Hz

freq.(Hz)	R(dB)	Roct (dB)
50	27	26
63	25	
80	27	
100	27	20
125	17	
160	23	
200	30	33
250	35	
315	35	
400	37	40
500	40	
630	44	
800	50	52
1000	53	
1250	54	
1600	50	47
2000	48	
2500	45	
3150	58	62
4000	73	
5000	109	

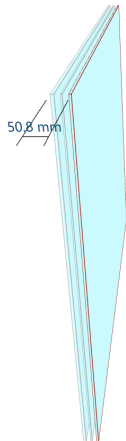


Sound Insulation Prediction (v10.0.3)

Program copyright Marshall Day Acoustics 2017 | Margin of error is generally within $R_w \pm 3$ dB

Date: 03/11/2025

Job Name:



R_w 45 dB

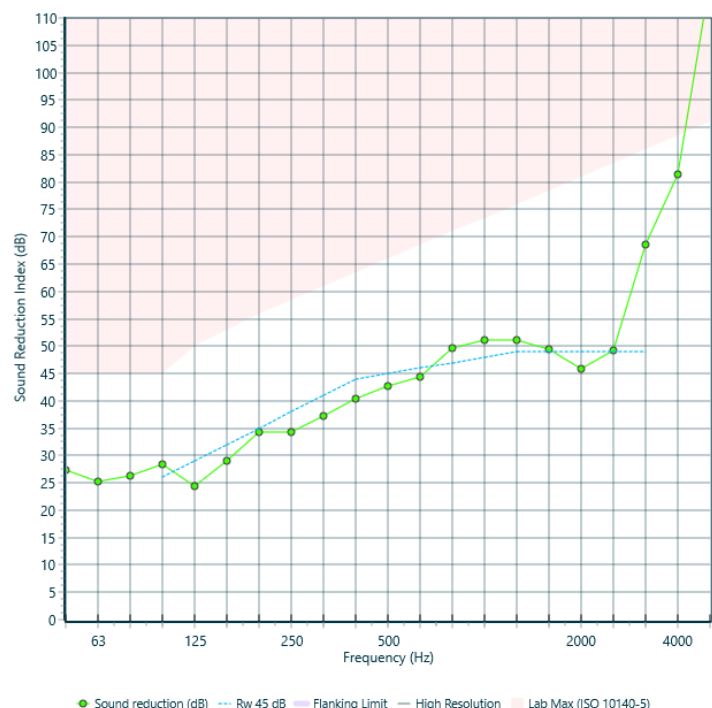
C -2 dB

Ctr -6 dB

System description

Pane 1	1 x 8.76 mm Laminated Glass (generic PVB)
Cavity	Aluminium Frame (Generic type), argon: 16 mm
Pane 2	1 x 4 mm Glass
Cavity	Aluminium Frame (Generic type), argon: 16 mm
Pane 3	1 x 6 mm Glass
Details	Wave-based model, Panel Size 1.3 m x 1.5 m, Partition surface mass = 44.6 kg/m ² , Mass-air-mass resonant frequency = : 129 Hz, 274 Hz

freq.(Hz)	R(dB)	Roct (dB)
50	27	
63	25	26
80	26	
100	28	
125	24	27
160	29	
200	34	
250	34	35
315	37	
400	40	
500	43	42
630	44	
800	50	
1000	51	51
1250	51	
1600	49	
2000	46	48
2500	49	
3150	68	
4000	81	73
5000	117	

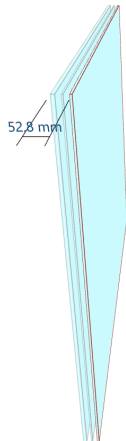


Sound Insulation Prediction (v10.0.3)

Program copyright Marshall Day Acoustics 2017 | Margin of error is generally within $R_w \pm 3$ dB

Date: 03/11/2025

Job Name:



R_w 46 dB

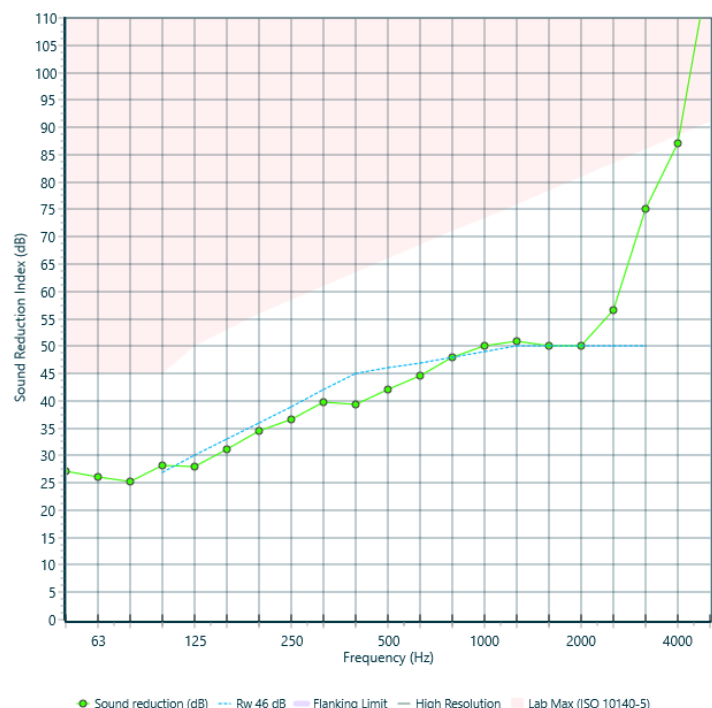
C -1 dB

Ctr -5 dB

System description

Pane 1	1 x 10.76 mm Laminated Glass (generic PVB)
Cavity	Aluminium Frame (Generic type), argon: 16 mm
Pane 2	1 x 4 mm Glass
Cavity	Aluminium Frame (Generic type), argon: 16 mm
Pane 3	1 x 6 mm Glass
Details	Wave-based model, Panel Size 1.3 m x 1.5 m, Partition surface mass = 49.4 kg/m ² , Mass-air-mass resonant frequency = : 123 Hz, 271 Hz

freq.(Hz)	R(dB)	Roct (dB)
50	27	26
63	26	
80	25	
100	28	29
125	28	
160	31	
200	35	37
250	37	
315	40	
400	39	41
500	42	
630	45	
800	48	49
1000	50	
1250	51	
1600	50	51
2000	50	
2500	57	
3150	75	80
4000	87	
5000	120	

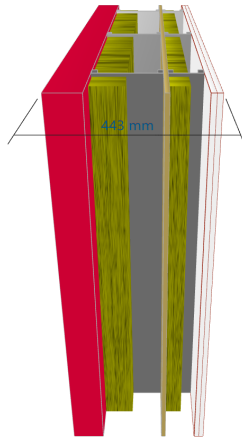


Sound Insulation Prediction (v10.0.3)

Program copyright Marshall Day Acoustics 2017 | Margin of error is generally within $R_w \pm 3$ dB

Date: 03/11/2025

Job Name:



R_w 60 dB

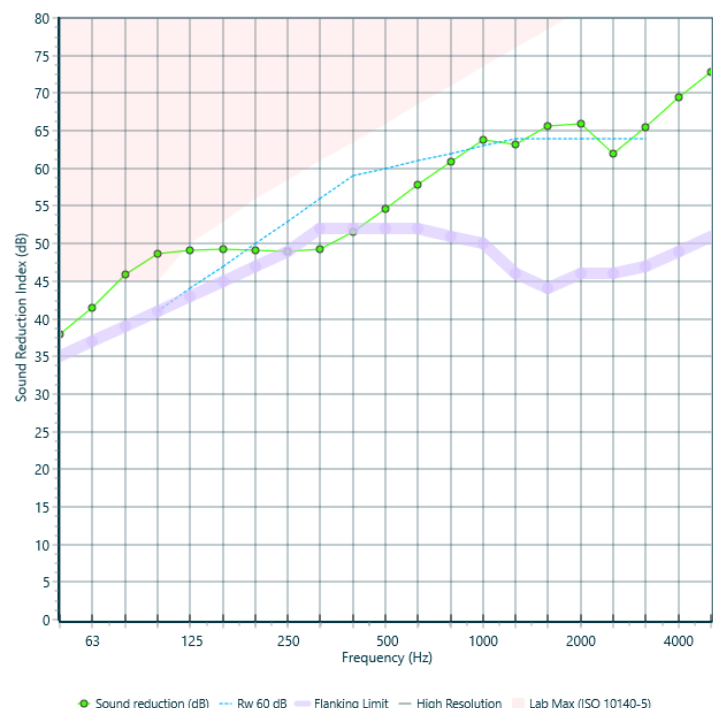
C -2 dB

Ctr -4 dB

System description

Panel 1	1 x 100 mm Brick
Frame	Steel Stud (1.15mm) (200 mm x 38 mm), Stud spacing 600 mm , Cavity Width 200 mm + 100 mm Fibreglass (10kg/m3) 60mm
Panel 2	1 x 13 mm RCM CemBoard (cement particle board...
Frame	Steel Stud (1.15mm) (100 mm x 38 mm), Stud spacing 600 mm , Cavity Width 100 mm + 60 mm Fibreglass (10kg/m3) 60mm
Panel 3	2 x 15 mm Gyproc SoundBloc 15mm
Details	Panel Size 2.7 m x 4.0 m, Partition surface mass = 203 kg/m ² , Mass-air-mass resonant frequency = : 21 Hz, 65 Hz

freq.(Hz)	R(dB)	Roct (dB)
50	38	
63	41	41
80	46	
100	49	
125	49	49
160	49	
200	49	
250	49	49
315	49	
400	51	
500	55	54
630	58	
800	61	
1000	64	62
1250	63	
1600	66	
2000	66	64
2500	62	
3150	66	
4000	69	68
5000	73	



LDG Contracts Ltd.

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FAX: 01772 258789



TECHNICAL SUBMITTAL - LDG CONTRACTS LTD

PROJECT:	BODDINGTON BREWERY	PROJECT NO.		DN0107
TITLE:	GLASS DATA SHEETS	PURPOSE:		APPROVAL
DOC. NO.	DN0107-LDG-ZZ-ZZ-TS-X-00038	DATE:	08-10-2025	P01

DESCRIPTION OF TECHNICAL SUBMITTAL

PAGE 01-05 - GLASS PERFORMANCE SHEETS
PAGE 06-08 - GLASS ACOUSTIC RATINGS / BANDINGS

ATTACHED DOCUMENTS

DN0107-LDG-ZZ-ZZ-TS-X-00038

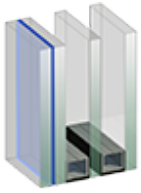
Boddingtons Brewery Manchester

LDG DOC. SUBMISSION
DOC. NO. DN0107-LDG-ZZ-ZZ-TS-X-00038

Make-up Name	Glass 1 & Coating	Glass 2 & Coating	Visible Light				Ultraviolet	Solar Energy					Thermal Properties	Embodied CO2	Acoustic Values			
			Transmittance	Reflectance		General Colour Rendering Index (Ra)	Trans UV (τ _{UV} %)	Transmittance	Reflectance	Solar Factor (g%)	Shading Coefficient (sc)	Secondary Heat Transfer (q _i)	U-Value		[eq. kg/m²] A1-A3	RW(C;Ctr)	OITC	STC
				Visible (τ _V %)	ρ _V % out													
G1	Guardian Extra Clear (CE)	Guardian Extra Clear (CE)	59.7	17.4	16.0	95.3	0.1	28.0	33.2	40.4	0.46	12.4	0.5	45.86	39(-2;-8)	27	39	
G2	Guardian Extra Clear (CE)	Guardian Extra Clear (CE)	59.4	17.2	16.0	95.0	0.1	27.8	31.3	40.0	0.46	12.2	0.5	50.20	43(-1;-5)	34	44	
G3	Guardian Extra Clear (CE)	Guardian Extra Clear (CE)	59.0	17.1	16.0	94.6	0.1	27.4	29.1	39.5	0.45	12.0	0.5	55.96	41(-1;-6)	32	42	

Calculation Standard: EN 410:2011 / EN 673:2011

G1



Total Unit (Nominal):

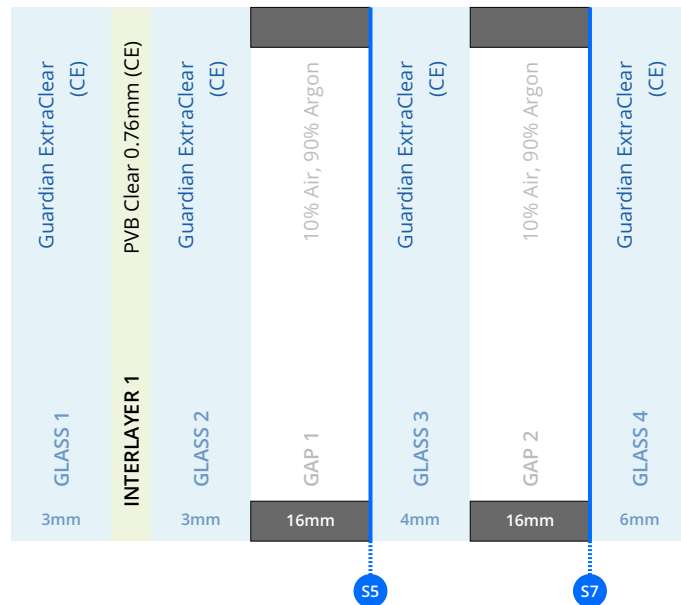
48.762 mm

Glazing Weight:

39.2 kg/m²

Slope: 90°

Outdoors



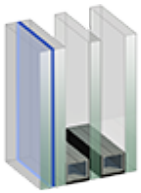
Indoors

Coatings

S5 SURFACE 5 COATING ClimaGuard® Neutral 1.0 Tempered (CE)

S7 SURFACE 7 COATING ClimaGuard® Neutral 1.0 Tempered (CE)

G2



Total Unit (Nominal):

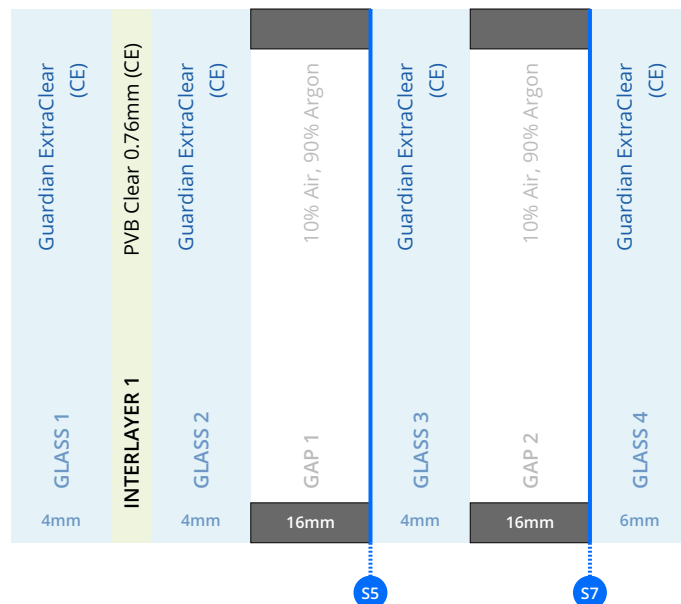
50.762 mm

Glazing Weight:

44.2 kg/m²

Slope: 90°

Outdoors



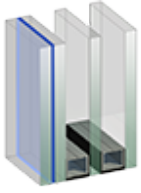
Indoors

Coatings

S5 SURFACE 5 COATING ClimaGuard® Neutral 1.0 Tempered (CE)

S7 SURFACE 7 COATING ClimaGuard® Neutral 1.0 Tempered (CE)

G3



Total Unit (Nominal):

52.762 mm

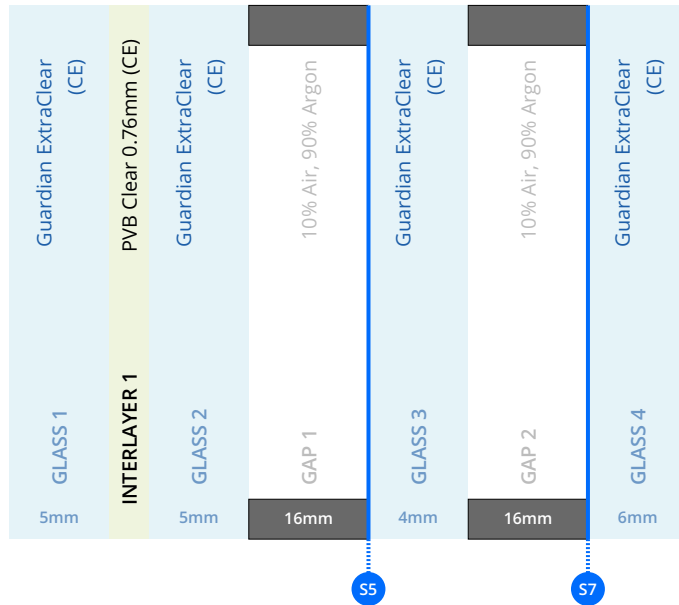
Glazing Weight:

49.24 kg/m²

Slope: 90°

Outdoors

Indoors



Coatings

S5 SURFACE 5 COATING ClimaGuard® Neutral 1.0 Tempered (CE)

S7 SURFACE 7 COATING ClimaGuard® Neutral 1.0 Tempered (CE)

Important Notes

Calculations and terms in this report are based on EN 410:2011/EN 673:2011. The performance values shown above represent nominal values for the center of glass with no spacer system or framing. Solar Factor (g) and Secondary Heat Transfer (qi) are not available for sloped glazing, as no calculation method is prescribed by the standard for these attributes.

The KIWA logo and KIWA Validation Report MD - 14/477/GL are provided as evidence of validation of the Guardian Performance Calculator software, program version 4.1, for execution of calculations of luminous and solar characteristics of glazing and thermal transmittance, according to EN 410:2011 and EN 673:2011.

Embodied CO₂ [eq. kg/m²] A1-A3 is estimated based on material Embodied Carbon Factor (ECF), derived from Guardian Glass Regional third-party independently verified and published / current Environmental Product Declarations (EPDs) which are produced to EN 15804 and are compliant with the requirements of ISO 14044, the International Life Cycle Assessment (LCA) standard, and ISO 14025 and ISO 21930, the international standards covering EPD for construction products. The A1-A3 ECF is an estimate of the embodied carbon due to production of that material, taking into account an average value of glass production thickness. The resulting material value should then be multiplied by the square area of glazing to provide an estimate of embodied carbon of the material at the project scale. Embodied CO₂ estimates provided by Guardian represent only values associated with the glass components manufactured by Guardian. The estimated values do not represent in any way a plant-specific and/or product specific guarantee.

Laminated products:

The Performance Calculator allows the user to model a wide variety of laminated glass makeups using different float glass substrates, coatings and interlayer material, including those makeups where the coating faces the interlayer. It is the user's responsibility to assess whether the laminated glass makeup meets relevant regional standards and complies with applicable laminated glass safety regulations.

In addition, when the laminated glass makeup includes a coating facing the interlayer material, there may be a loss of thermal insulation performance and a color change compared to non-embedded coated glass.

The security and safety properties of laminated products certified under EN 356 (Burglar Resistance) and EN 12600 (Pendulum Body Impact Resistance) are valid exclusively if the laminated products are produced directly by Guardian.

Non-specular products (translucent or diffuse):

The performance measurement for non-specular (translucent or diffuse) materials such as translucent interlayers or acid etched glass surface, or surface with ceramic frit is limited by the current experimental technologies. Since measurements capture physically only a part of the resulting radiation, calculated performance results provided herein and based on such measurements are not compliant with any standard (including EN 410) and may only be used as a general reference. Actual values may vary significantly based upon exact fabrication process, as well as type, thickness and color of used non-specular material.

Explanation of Terms according to EN 410:2011/EN 673:2011

Visible Light Transmittance (T_v , %) is the percentage of incident light in the wavelength range of 380 nm to 780 nm that is transmitted by the glass.

Ultraviolet (UV) Transmittance (T_{uv} , %) is the percentage of the incident UV component of the solar radiation in the wavelength range of 280 nm to 380 nm that is transmitted by the glass.

Solar Energy Direct Transmittance (T_e , %) is the percentage of incident solar energy in the wavelength range of 300 nm to 2500 nm that is directly transmitted by the glass.

Visible Light Reflectance Outdoors/Indoor (R_v out/in, %) is the percentage of incident visible light directly reflected by the glass.

Solar Direct Reflectance Outdoors/Indoors (R_e out/in, %) is the percentage of incident solar energy directly reflected by the glass.

Solar Energy Absorptance (A_e , %) is the percentage of the sun's energy that is absorbed by glass.

U-Value (U_g , W/m² K) is the glazing parameter that characterizes the heat transfer through the central part of the glazing, i.e. without edge effects, and expresses the steady-state density of heat transfer rate per temperature difference between the environmental temperatures on each side. Temperature differential according to standard conditions: $\Delta T = 15K^\circ$. The lower the value, the greater is the insulating value. EN 673 defines the value with 1 decimal place. The value is also provided with 3 decimal places for informational purposes.

Solar Factor or Total Solar Energy Transmittance or g-value (g%) is the total solar radiation transmitted by the glass.

Shading Coefficient (sc) is Solar Factor divided by 0.87. It is a measure of the solar heat gain referenced to 3 mm clear glass which has the designated value of 1.00.

Secondary Heat Transfer Coefficient (q_i) is the result of heat transfer by convection and longwave IR-radiation of that part of the incident solar radiation which has been absorbed by the glazing.

Colour Rendering Index in transmission, D65 (R_a) is the change in colour of an object as a result of the light being transmitted through the glass.

The security and safety properties of laminated products certified under EN 356 (Burglar Resistance) and EN 12600 (Pendulum body impact resistance) are valid exclusively if the laminated products are produced directly by Guardian

Disclaimer for Acoustic Performance

Disclaimer for Acoustic Performance: The acoustic performance data provided in the reports is based on a test protocol or an estimation and may be used if user actual glazing is identical to input data described herein. Acoustic performance data herein is only applicable for glazing dimensions 1,23 m x 1,48 m (as per testing standard). Estimation of acoustic performance is based on component-similarity assumptions which are derived from measured data and interpolation to expand the database of values from test protocols. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 10140-3/EN ISO 10140-2, some variation in the calculated performance can also be expected. As such, the weighted performance, R_w , and adaptation terms, C and Ctr, should typically be considered to be accurate within ± 2 dB. However, wider deviations can occur. Actual performance may vary according to the glazing dimensions, frame system, noise sources and many other parameters. The acoustic performance data herein should not be used as a substitute for tests of actual glazing. For more information, please consult Assumptions and Terminology section in Guardian Acoustic Assistant.

By accessing this calculator, you agree not to alter or modify the generated report data and information, by any means. Any manual alteration will be your own responsibility and will annul all the content of the report.

Disclaimer

This performance analysis is provided for the limited purpose of assisting the user in evaluating the performance of the glass products identified on this report. Spectral data for products manufactured by Guardian reflect nominal values derived from typical production samples or CE Initial Type Testing and subject to variations due to manufacturing and calculation tolerances. Spectral data for products not manufactured by Guardian were derived from the LBNL International Glazing Database and have not been independently verified by Guardian. Guardian recommends a full-size mock-up be approved. The values provided herein are generated according to established engineering practices and applicable calculation standards. Many factors may affect glazing characteristics, including glass size, building orientation, shading, wind speed, type of installation, production process and others. The applicability and results of the analysis are directly related to user inputs and any changes in actual conditions can have a significant effect on the results. It is the responsibility of the users of the analysis to ensure that the intended application is appropriate and complies with all relevant laws, regulations, standards, codes of practices, processing guidelines and other requirements. Guardian makes no guarantee that any glazing modeled herein is available from Guardian or any other manufacturer. The user has the responsibility to check with the manufacturer regarding availability of any glass type or make-up.

All the HT/T coatings must undergo heat treatment. The specified values for these coatings are valid only once the heat treatment process has been completed.

While Guardian has made a good faith effort to verify the reliability of the tools used for this analysis, they may contain unknown programming errors that could result in inaccurate results. The user assumes all risk relating to the results provided and is solely responsible for selection of appropriate products for user's application. Guardian makes no express or implied warranty of any kind with respect to the tools used by Guardian and this analysis. There are no warranties of merchantability, non-infringement or fitness for a particular purpose with respect to the tools used by Guardian and this analysis and no warranty shall be implied by operation of law or otherwise. The only warranties applicable to Guardian products are those separately provided in writing for each product. In no event shall Guardian be liable for direct, indirect, special, consequential or incidental damages of any kind relating to or resulting from use of Guardian tools and analyses. Trademarks owned by Guardian Industries, LLC and/or its affiliates may be registered in the United States and other jurisdictions. All other trademarks are property of their respective owners.

User hereby represents and warrants that it is the rightful owner of all intellectual property rights (the "IP Rights") in and to any logos, images, or trademarks user uploads for application in the Guardian Performance Calculator output report. User agrees to indemnify, defend and hold harmless Guardian Industries, LLC and its affiliates, directors, officers, employees, and agents from and against any and all losses, damages, liabilities, claims, demands, suits, judgments, settlements, costs and expenses (including reasonable attorneys' fees and costs) arising out of or in connection with any third-party claim or action that the use of such logos, images or trademarks infringe or misappropriate any other third-party IP Rights. By using a logo, image or trademark, user acknowledges and accepts the terms of this disclaimer and agrees to comply with all applicable laws and regulations governing the use of the logo, image, or trademark.

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Program Version: 4.1.0.9854
Database Version: 20250625



Acoustic Performance

Glazing Configuration

6.76mm (33.2) LamiGlass (PVB)

16mm Cavity

4mm Float Glass

16mm Cavity

6mm Float Glass

Sound Reduction Indices

Frequency, Hz / dB*						Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	4000	39	-2	-8	27	39
17	31	37	47	43	57					

*The values expressed in the frequency table correspond to the central values of the 1/3 octave band

Disclaimer: The acoustic performance data provided in the reports is based on a test protocol or an estimation and may be used if user actual glazing is identical to input data described herein. Acoustic performance data herein is only applicable for glazing dimensions 1,23 m x 1,48 m (as per testing standard). Estimation of acoustic performance is based on component-similarity assumptions which are derived from measured data and interpolation to expand the database of values from test protocols. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 10140-3/EN ISO 10140-2, some variation in the calculated performance can also be expected. As such, the weighted performance, R_w , and adaptation terms, C and C_{tr} , should typically be considered to be accurate within ± 2 dB. However, wider deviations can occur. Actual performance may vary according to the glazing dimensions, frame system, noise sources and many other parameters. The acoustic performance data herein should not be used as a substitute for tests of actual glazing. For more information, please consult Assumptions and Terminology section in Guardian Acoustic Assistant. By accessing this calculator, you agree not to alter or modify the generated report data and information, by any means. Any manual alteration will be your own responsibility and will annul all the content of the report.



Acoustic Performance

Glazing Configuration

8.76mm (44.2) LamiGlass (PVB)

16mm Cavity

4mm Float Glass

16mm Cavity

6mm Float Glass

Sound Reduction Indices

Frequency, Hz / dB*						Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	4000	43	-1	-5	34	44
25	32	43	49	43	60					

*The values expressed in the frequency table correspond to the central values of the 1/3 octave band

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Acoustic Performance

Glazing Configuration

10.76mm (46.2) LamiGlass (PVB)

16mm Cavity

4mm Float Glass

16mm Cavity

6mm Float Glass

Sound Reduction Indices

Frequency, Hz / dB*						Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	4000	41	-1	-6	31	42
21	33	38	49	50	63					

*The values expressed in the frequency table correspond to the central values of the 1/3 octave band

Disclaimer: The acoustic performance data provided in the reports is based on a test protocol or an estimation and may be used if user actual glazing is identical to input data described herein. Acoustic performance data herein is only applicable for glazing dimensions 1,23 m x 1,48 m (as per testing standard). Estimation of acoustic performance is based on component-similarity assumptions which are derived from measured data and interpolation to expand the database of values from test protocols. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 10140-3/EN ISO 10140-2, some variation in the calculated performance can also be expected. As such, the weighted performance, R_w , and adaptation terms, C and C_{tr} , should typically be considered to be accurate within ± 2 dB. However, wider deviations can occur. Actual performance may vary according to the glazing dimensions, frame system, noise sources and many other parameters. The acoustic performance data herein should not be used as a substitute for tests of actual glazing. For more information, please consult Assumptions and Terminology section in Guardian Acoustic Assistant. By accessing this calculator, you agree not to alter or modify the generated report data and information, by any means. Any manual alteration will be your own responsibility and will annul all the content of the report.