



Deansgate South, Manchester

Noise Insulation Scheme – Planning Condition 18a

8512.2

8th June 2023

Revision A



Deansgate South, Manchester

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1 Summary

- 1.1 This report has been prepared in response to planning condition no. 18a of the Appeal Decision Notice ref. APP/B4215/W/21/3287525 for the student residential development at the junction of the A56 Bridgewater Viaduct and Deansgate, Manchester.
- 1.2 Condition 18a requires internal ambient noise levels to be below set limits.
- 1.3 Noise levels affecting the proposed development from road traffic and other sources have been measured during the day and night, and the façade noise impact calculated.
- 1.4 Noise propagation across the site is calculated in environmental noise modelling software, CadnaA.
- 1.5 The façade sound insulation design has been developed to meet the required indoor ambient noise levels from the planning condition.
- 1.6 The acoustic performance requirements for glazing and ventilators are summarised in Table 6 and the sound insulation treatments required for each façade are shown in Appendix A.
- 1.7 An overheating analysis has been undertaken by RIDGE and the results show that all habitable rooms comply with the thermal comfort criteria as set out in CIBSE TM59:2017 with windows closed at night for the bedrooms, as required to meet the Building Regulations for Part O.
- 1.8 Noise levels in all external terrace areas are calculated to be below 50 dB $L_{Aeq, 16 \text{ hr}}$ without requiring any further noise mitigation, thereby complying with the requirements of the planning condition 18a.
- 1.9 Based on the details outlined in this report, the proposed sound insulation for the scheme meets with the requirements of planning condition 18a.

2 Introduction

- 2.1 A student residential development has been proposed at the junction of the A56 Bridgewater Viaduct and Deansgate, Manchester.
- 2.2 The building comprises student bedrooms & studios together with communal student facilities including social spaces and a gym.
- 2.3 Apex Acoustics has been commissioned to produce a noise insulation scheme to meet the requirements of planning condition 18a.
- 2.4 The assessment is based on noise measurement undertaken for the noise assessment submitted with the planning application for the scheme.
- 2.5 The primary noise sources considered in this assessment are:
- Road traffic noise on the A56 to the north of the site;
 - Road traffic noise on Deansgate to the south of the site.
- 2.6 The site location is shown in Figure 1.
- 2.7 The scope of our appointment includes:
- Measure the existing noise environment over a 24-hour period at two locations;
 - Noise modelling based on the proposed layouts to determine noise levels impacting across the site;
 - Determine potential noise impact under whole dwelling ventilation condition;
 - Provide a detailed scheme for the mitigation to meet the criteria within the planning condition 18a.



Figure 1: Site location outlined in red

3 Planning condition

3.1 The Appeal Decision Notice (reference no. APP/B4215/W/21/3287525) includes the following condition:

3.2 **Condition 18a:**

3.3 *Notwithstanding the details shown in the approved drawings and documents, before the development commences a scheme for acoustically insulating the proposed student accommodation against noise from Bridgewater Viaduct, Deansgate, and the nearby tram and railway lines shall be submitted to and approved in writing by the local planning authority.*

The potential for overheating shall also be assessed and the noise insulation scheme shall take this into account. The approved noise insulation and ventilation scheme shall be completed before any of the units are occupied.

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

Bedrooms (night time 23:00 to 07:00) - 30 dB L_{Aeq} (individual noise events

shall not exceed 45 dB L_{AmaxF} by more than 15 times);

Living rooms (daytime 07:00 to 23:00) - 35 dB L_{Aeq} ;

Gardens and terraces (daytime) - 55 dB L_{Aeq} .

3.4 Noise levels within the external terrace areas are discussed in section 6 of this report. Glazing and ventilation requirements are outlined in section 7, together with a discussion of the overheating strategy.

4 Noise sources and measurements

4.1 Measurements

4.2 The baseline noise environment was measured continuously for 24 hours starting on 19th October 2020 at the following two positions (as shown in Figure 1):

- Position LT1: at the rear of Stay Deansgate
- Position LT2: at the proposed development site



Figure 2: Measurement locations

4.3 The microphone was located at 3.5 m above ground level, away from other reflecting surfaces, such that the measurements are considered to be free-field.

4.4 The equipment used is listed in Table 1.

Equipment	Model	Serial no.
Sound Level Meter	NTi XL2	A2A-11084-E0
Calibrator	Larson Davis CAL 200	10665
Sound Level Meter	NTi XL2	A2A-11062-E0
Calibrator	Larson Davis CAL 200	13403

Table 1: Equipment used

- 4.5 All sound level meters and calibrators used meet the technical specifications of BS 7445 and have current calibration certificates traceable to national standards. The equipment was field-calibrated before and after the measurement with no significant drift in sensitivity noted.
- 4.6 Weather conditions were dry with wind speeds below 5 m/s.
- 4.7 **Noise sources**
- 4.8 The measured noise levels include the road traffic from the nearby road network, construction noise from the residential development to the north of the site and building services plant noise from the east (Stay Deansgate) and from the south (North Tower).

4.9 **Results**

4.10 The measured daytime and night-time noise levels are shown in Table 2.

Position	Parameter	dB(A)	Octave band centre frequency, Hz							
			Measured A-weighted noise levels, dB							
			63	125	250	500	1k	2k	4k	8k
LT1 (Deansgate)	Daytime, L _{Aeq, 16 hr}	63	44	47	51	55	60	56	50	42
	Night time, L _{Aeq, 8 hr}	55	32	37	43	47	52	48	41	33
LT2 (A56)	Daytime, L _{Aeq, 16 hr}	73	43	49	57	62	70	67	58	48
	Night time, L _{Aeq, 8 hr}	64	36	41	49	55	62	58	47	36

Table 2: Measured A-weighted noise levels

4.11 The highest maximum night-time noise levels from transport sources are shown in Table 3.

Position	n th highest L _{Amax,F} (dB)		
	1 st	10 th	15 th
LT1	80	72	70
LT2	90	82	82

Table 3: Measured L_{AFmax} events during the night-time period

4.12 **Railway and tram lines**

- 4.13 The railway line is located approximately 100 m to the north of the site, with the tram line approximately a further 50 m beyond.
- 4.14 Noise maps were launched by DEFRA (Department for Environment, Food and Rural Affairs) in May 2008 to identify noise levels from major roads and railway lines across England.
- 4.15 The daytime and night time noise levels for the railway line are shown in Figure 3 and Figure 4. The noise levels at the proposed site are below 55 dB L_{Aeq,16hr} during the daytime and 50 dB L_{Aeq,8hr} during the night time and so would not contribute significantly to the overall noise climate at the site.

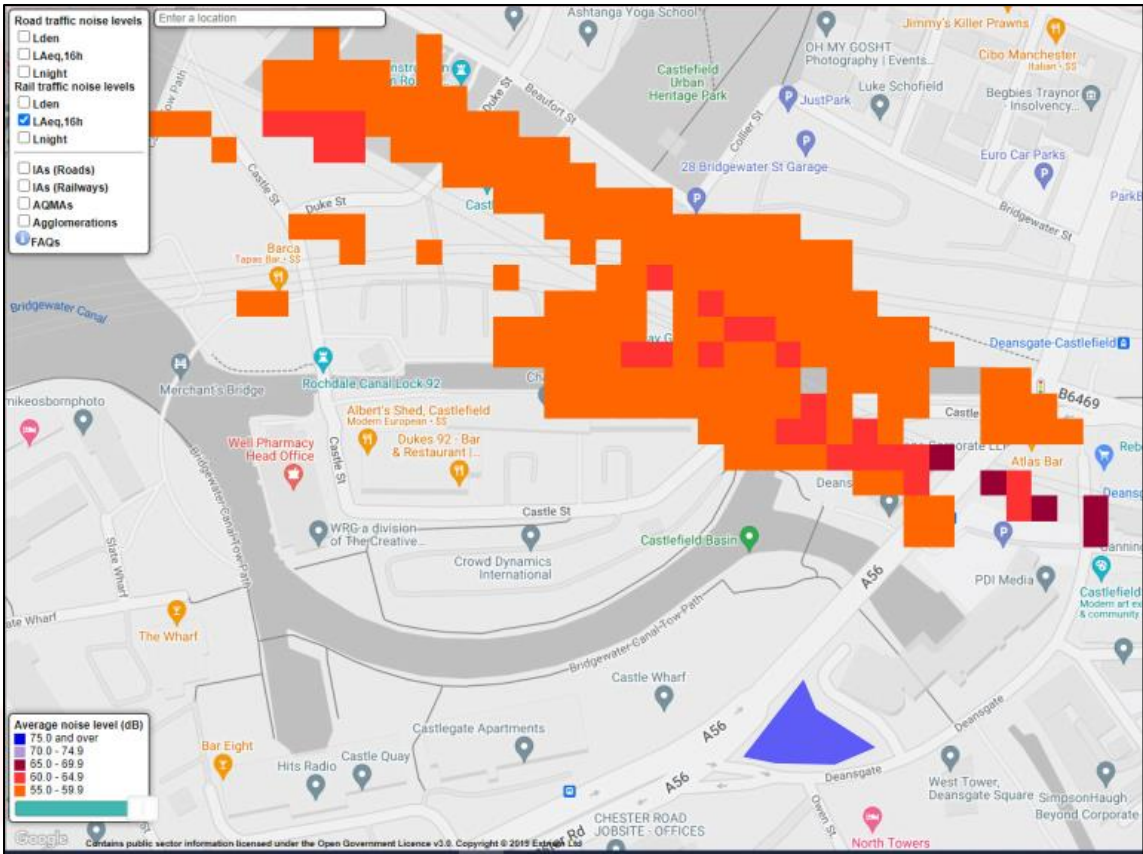


Figure 3: DEFRA noise map for rail noise – Daytime (proposed site in blue)

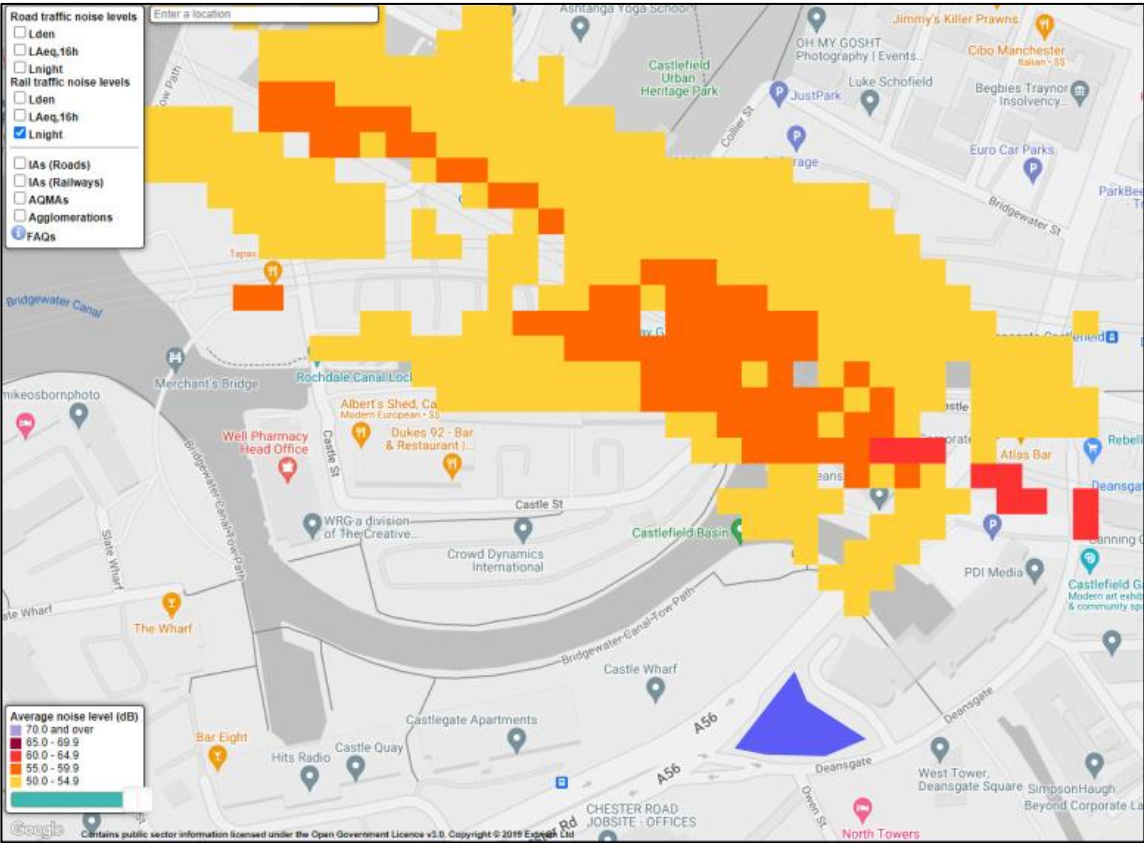


Figure 4: DEFRA noise map for rail noise – Night-time (proposed site in blue)

- 4.16 Noise measurements of the Manchester Metrolink tram network were carried out over 24 hour periods at various locations within Manchester and the surrounding areas by Apex Acoustics in 2018.
- 4.17 Measurements taken on Aytoun Street in Manchester city centre indicate a noise level due to the trams at 5 m from the nearside rail of 65 dB $L_{Aeq,16hr}$, 58 dB $L_{Aeq,8hr}$ and a 10th highest $L_{Amax,F}$ of 87 dB. Correcting for distance from the tram line, this would result in noise levels at the proposed site of 50 dB $L_{Aeq,16hr}$, 43 dB $L_{Aeq,8hr}$ and a 10th highest $L_{Amax,F}$ of 65 dB. The tram network would therefore not contribute to the overall noise climate at the site.

5 Noise impact on the site

- 5.1 Noise transmission and propagation is modelled using proprietary software, Cadna/A, Reference 2. This models noise propagation outdoors according to ISO 9613, Reference 3.
- 5.2 The modelling parameters used, source of data and details are described in Table 4.

Parameter	Source	Details
Model dimensions	Google Earth	British Transverse Mercator coordinates
Site location and layout	Architects drawings	Architects drawings, Reference 4
Topography –within site	Site observations and Google Street view	Modelled with no changes in topography
Topography –Outside of site	Site observations and Google Street view	Modelled with no changes in topography
Building heights – proposed buildings	Drawings	Architects drawings
Building heights – outside of site	Site observations and Google Street view	3 m per storey + 2 m roof (residential properties)
Receptor positions	Site observations and Google Street view	On the façade closest to the source at a height of 1.5 m, 4 m and 6.5 m to represent ground, first and second floor window heights respectively
Building and barrier absorption coefficient	ISO 9613-2	0.21 to represent a reflection loss of 1 dB
G, Ground factor	ISO 9613-2	Hard ground, G = 0; Porous ground, G = 1 (locally on model)
Max. order of reflections	Apex Acoustics	Three

Table 4: Modelling parameters and assumptions

- 5.3 Measured daytime and night-time noise levels have been used to ascribe sound power levels to the surrounding roads, and the noise impact at the proposed building façades has been calculated.
- 5.4 Measured maximum noise levels due to vehicle passes have been used to attribute sound power levels to a point source. The position of the point source has been shifted along the road to calculate the potential worst-case noise impact at each building façade.
- 5.5 The calculated noise contours results for the daytime $L_{Aeq, 16 hr}$ are shown in Figure 5 to Figure 8.

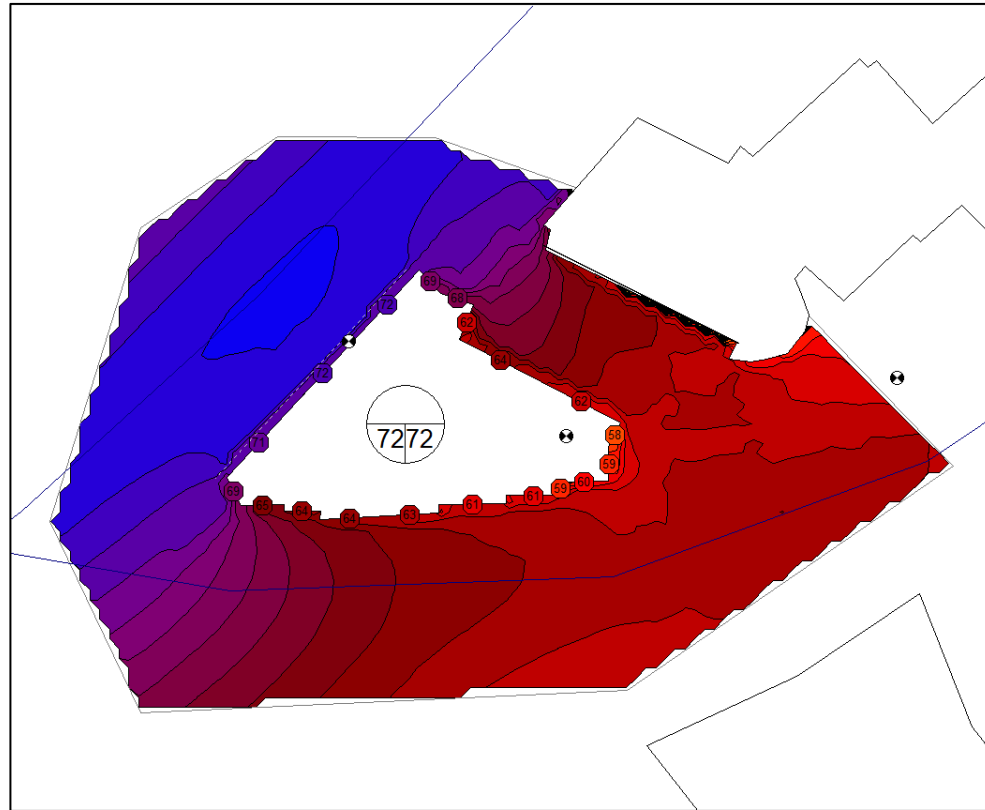


Figure 5: Free-field daytime $L_{Aeq,16hr}$ noise levels incident on building facades – 1st floor

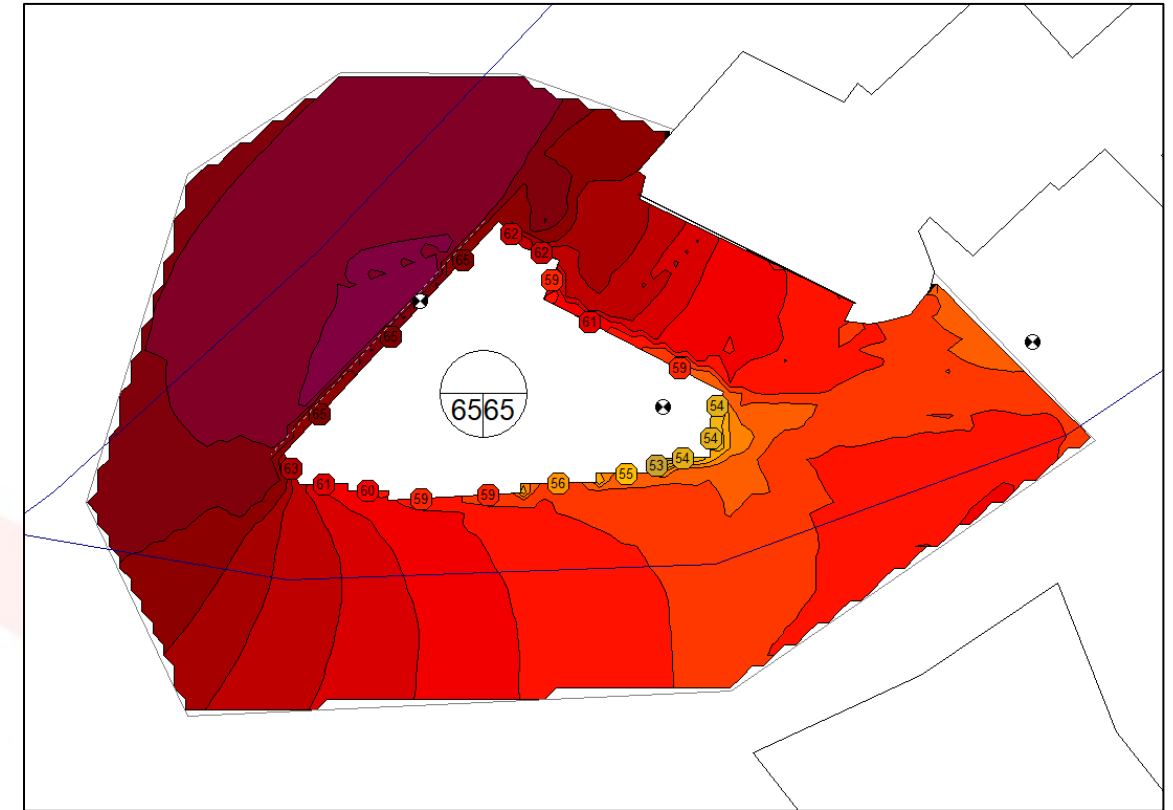


Figure 7: Free-field daytime $L_{Aeq,16hr}$ noise levels incident on building facades – 13th floor

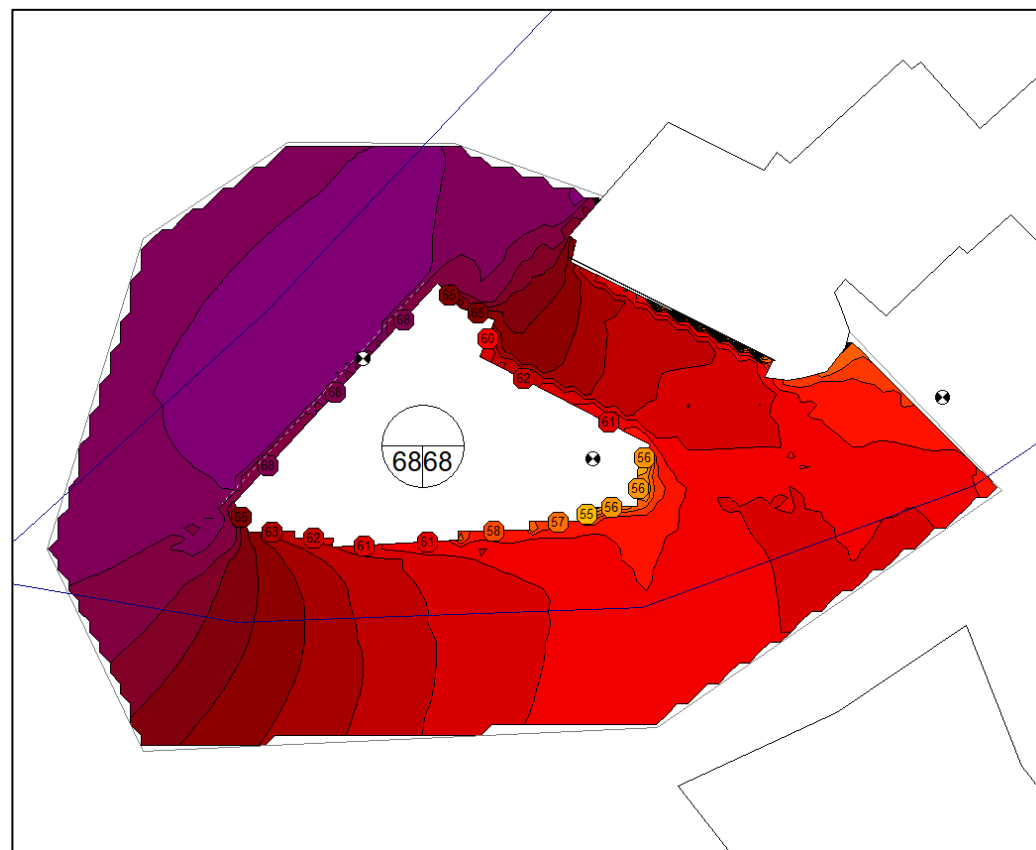


Figure 6: Free-field daytime $L_{Aeq,16hr}$ noise levels incident on building facades – 7th floor

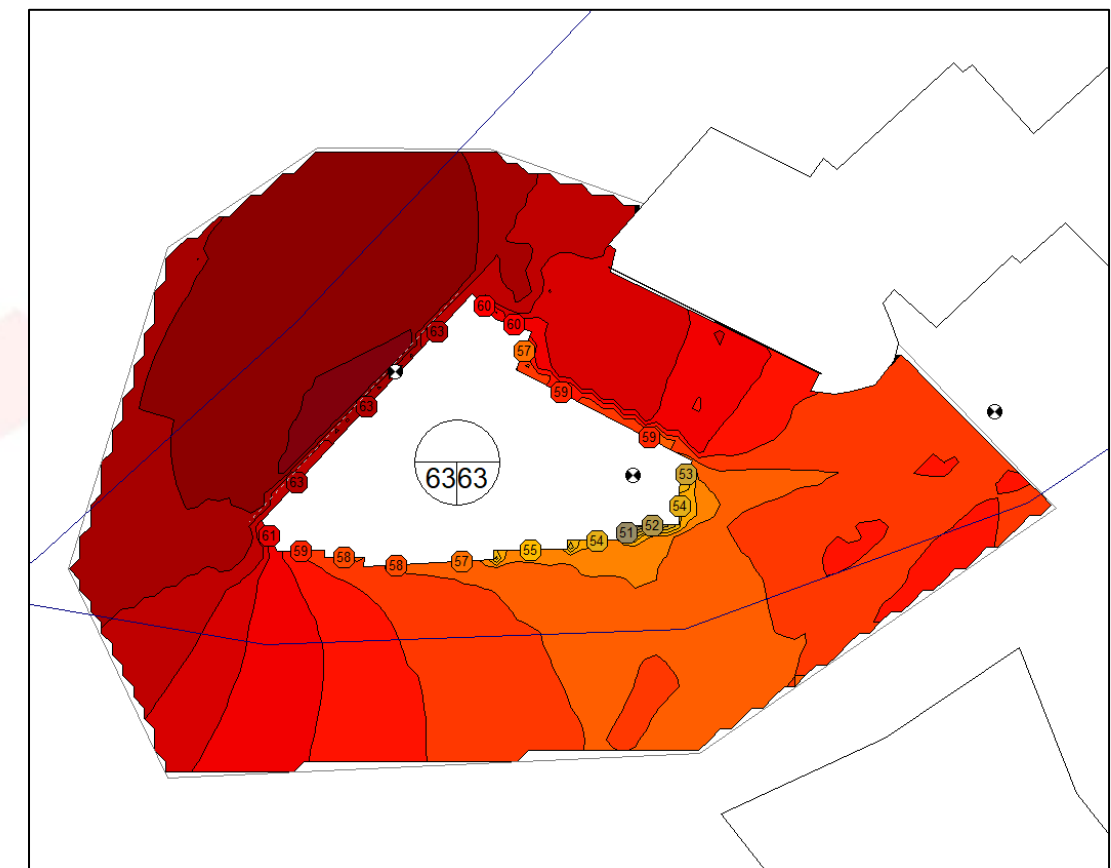


Figure 8: Free-field daytime $L_{Aeq,16hr}$ noise levels incident on building facades – 19th floor

6 External amenity area assessment

- 6.1 There are external terrace areas indicated on the plans at 22nd, 24th & 26th floor level, to the rear elevation of the building facing towards Deansgate.
- 6.2 The results of the modelling undertaken predict that noise levels on the terraces would be no greater than 50 dB $L_{Aeq,16hr}$, thereby complying with the requirements of the planning condition 18a.

7 Achieving internal noise levels

7.1 Ventilation calculations

- 7.2 It is understood that all residential rooms are to be ventilated using mechanical ventilation with heat recovery (MVHR). This system does not require the use of trickle vents within the façade or the windows to be opened to provide ventilation in line with the requirements of Part F of the Building Regulations.

7.3 Façade sound insulation calculations

- 7.4 Free-field noise levels at the windows of the most exposed rooms which are used in the façade sound insulation calculations are shown in Table 5.
- 7.5 Octave band $L_{Aeq,T}$ noise levels in the 125 Hz to 2 kHz calculation range indicated in BS 8233 have been adjusted to match the single figure calculated A-weighted noise level.

Façade affected	Parameter	dB(A)	Octave band centre frequency, Hz A-weighted free-field noise level, dB				
			125	250	500	1k	2k
North	$L_{Aeq,16\text{ hr}}$	73	49	57	63	70	67
	$L_{Aeq,8\text{ hr}}$	64	41	49	55	62	58
	$L_{AFmax, 15th\text{ highest}}$	82	-	-	-	-	-

Table 5: A-weighted external free-field noise levels used to calculate façade sound insulation

- 7.6 Calculations have been carried out to determine the glazing specification required to achieve the internal noise level criteria stated within condition 18a.
- 7.7 The calculation method for façade sound insulation is in accordance with BS 8233 and the principles of BS EN 12354-3, Reference 7.
- 7.8 From ISO 16283, Reference 8, the reverberation time is typically 0.5 seconds across the relevant frequency range for a furnished living room. This value is used for both living rooms and bedrooms.
- 7.9 Details of the methodology used to calculate internal noise levels are provided on our website: <https://www.apexacoustics.co.uk/calculation-facade-sound-insulation/>.
- 7.10 Noise levels in less exposed but similarly protected rooms will be lower and therefore also comply with the internal noise level targets.
- 7.11 The most exposed rooms are those with the largest ratio of window area to room volume, as well as those closest and most exposed to the noise sources.

7.12 Table 6 provides details of the minimum glazing acoustic performance required to achieve the internal noise level criteria. The mark-ups in Appendix A identify the required locations of each glazing type.

Zone	Glazing performance
Zone 1	36 dB $R_w + C_{tr}$
Zone 2	30 dB $R_w + C_{tr}$
Zone 3	27 dB $R_w + C_{tr}$

Table 6: Summary of minimum façade sound insulation treatment

7.13 The sound reduction of the non-glazed portions of the facade has been assumed to be considerably higher than that of the glazing, and noise ingress through these areas of the building envelope is disregarded as insignificant.

7.14 The room and window dimensions used in the calculations are taken from the architects' plans and elevations, Reference 5.

7.15 Calculated internal noise levels on the basis of the identified minimum performance requirements are presented in Table 7.

Façade affected	Room affected	Calculated internal level		
		Daytime dB $L_{Aeq, 16\text{ hr}}$	Night-time dB $L_{Aeq, 8\text{ hr}}$	Night-time dB $L_{Amax, F}$
North	Bedroom	34	26	42
	Living room	34	-	-

Table 7: Summary of calculated worst-case internal noise levels

7.16 Based on the proposed façade sound insulation provision and the level and frequency of the measured maximum noise event, 45 dB $L_{Amax, F}$ is unlikely to be exceeded more than 15 times per night, and therefore achieve the internal noise level criteria stated within condition 18a.

7.17 Internal mechanical services noise levels

7.18 Noise from mechanical services systems within residential areas during the whole dwelling ventilation condition should not exceed the following limits:

- Bedrooms and studios: ≤ 26 dB(A)
- Kitchen / living rooms: ≤ 30 dB(A)

7.19 The above limits are to allow for the overall indoor ambient noise level, including external noise ingress, to meet with the criteria from condition 18a.

7.20 Noise from mechanical systems within other areas of the building should be in accordance with CIBSE Guide A.

7.21 Overheating

7.22 Condition 18a requires that consideration be given to the potential for overheating.

7.23 A thermal modelling has been undertaken by RIDGE and the TM59 report, Reference 14, has been provided by the overheating consultants.

7.24 The overheating analysis has been carried out on six sample bedrooms and two kitchen spaces at the proposed development to show compliance with the thermal comfort criteria as set out in CIBSE TM59:2017 "Design methodology for the assessment of overheating risk in homes".

7.25 The proposed building design utilises a summer bypass mechanical ventilation heat recovery (MVHR) system.

7.26 The required MVHR ventilation rate and the equivalent free area for each opening type to mitigate overheating have been included in the TM59 report. The free area for each window openings is reproduced in Table 8.

OPENING TYPE	DIMENSIONS	GLAZING AREA (M ²)	OPENABLE AREA (M ²)	OPENING PROFILE
Opening panel	0.38m W x 2.64m H	1.0	0.4	Between 7am-11pm, the opening panel is open when the internal temperature exceeds 22°C. At all other times, the opening panel is closed regardless of the internal temperature.
Window	0.87m W x 2.64m H	2.3	0	The windows are closed regardless of the internal temperature.

Table 8: Window openings and profiles to meet overheating requirements

7.27 The opening panel does not have a window restrictor but is limited to opening from 7am – 11pm, and between these hours, when the internal room temperature exceeds 22 degC and the space is occupied, the panel will open, as per CIBSE TM59:2017. The windows are closed regardless of the internal temperature.

7.28 Based on the modelling conducted, the results show that all habitable rooms for the sample bedrooms and the kitchen spaces comply with Part O of the Building Regulations which requires noise levels to be controlled during the night-time.

8 Conclusion

- 8.1 The existing noise impact across the proposed development site has been assessed in support of discharging Planning Condition 18a.
- 8.2 An acoustic design process is undertaken to demonstrate how the identified medium risks of adverse noise impact can be mitigated and minimised in the finished development.
- 8.3 The potential implications for the design of the façade sound insulation under whole dwelling conditions as described by AD-F is discussed, and the glazing acoustic performance requirements to achieve the indoor noise level targets are identified in Table 6.
- 8.4 An overheating analysis has been undertaken by RIDGE and the results show that all habitable rooms comply with the thermal comfort criteria as set out in CIBSE TM59:2017 with windows closed at night for the bedrooms.
- 8.5 Based on the details outlined in this report, the proposed sound insulation for the scheme meets with the requirements of planning condition 18a.

9 References

- 1 BS 7445:2003, Description and measurement of environmental noise. Guide to quantities and procedures.
- 2 Cadna/A environmental noise modelling software, version 2020, Datakustik GmbH.
- 3 ISO 9613: Acoustics - Attenuation of sound during propagation outdoors.
- 4 Architects Drawing, Deansgate South Manchester, Proposed – Site Location Plan, Drawing no. 20269-0300, Rev P-02, dated 2nd December 2020.
- 5 Architects Drawing, Deansgate South Manchester, General Arrangement – Plan – 01 – Typical First to Twenty First Floor, Drawing no. 20269-2013, Rev T-00, dated 20th June 2022.
- 6 Approved Document F 2021 Edition, The Building Regulations 2000.
- 7 BS EN 12354-3:2000, Building Acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound.
- 8 BS EN ISO 16283-1:2014 Acoustics – Field measurement of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation.
- 9 Architects Drawing, Deansgate South Manchester, General Arrangement – Plan – 22 – Twenty Second Floor, Drawing no. 20269-2034, Rev T-00, dated 20th June 2022.
- 10 Architects Drawing, Deansgate South Manchester, General Arrangement – Plan – 23 – Twenty Third Floor, Drawing no. 20269-2035, Rev T-00, dated 20th June 2022.
- 11 Architects Drawing, Deansgate South Manchester, General Arrangement – Plan – 24 – Twenty Fourth Floor, Drawing no. 20269-2036, Rev T-00, dated 20th June 2022.
- 12 Architects Drawing, Deansgate South Manchester, General Arrangement – Plan – 26 – Twenty Sixth Floor, Drawing no. 20269-2038, Rev T-00, dated 20th June 2022.
- 13 Architects Drawing, Deansgate South Manchester, General Arrangement – Plan – 27 – Twenty Seventh Floor, Drawing no. 20269-2039, Rev T-00, dated 20th June 2022.
- 14 TM59 Report, RIDGE, Deansgate South Fusion Students, Report no. 5013010-RDG-XX-XX-DOC-ME-001 V1.0, dated 22nd December 2022.

Appendix A Façade Mark-Ups

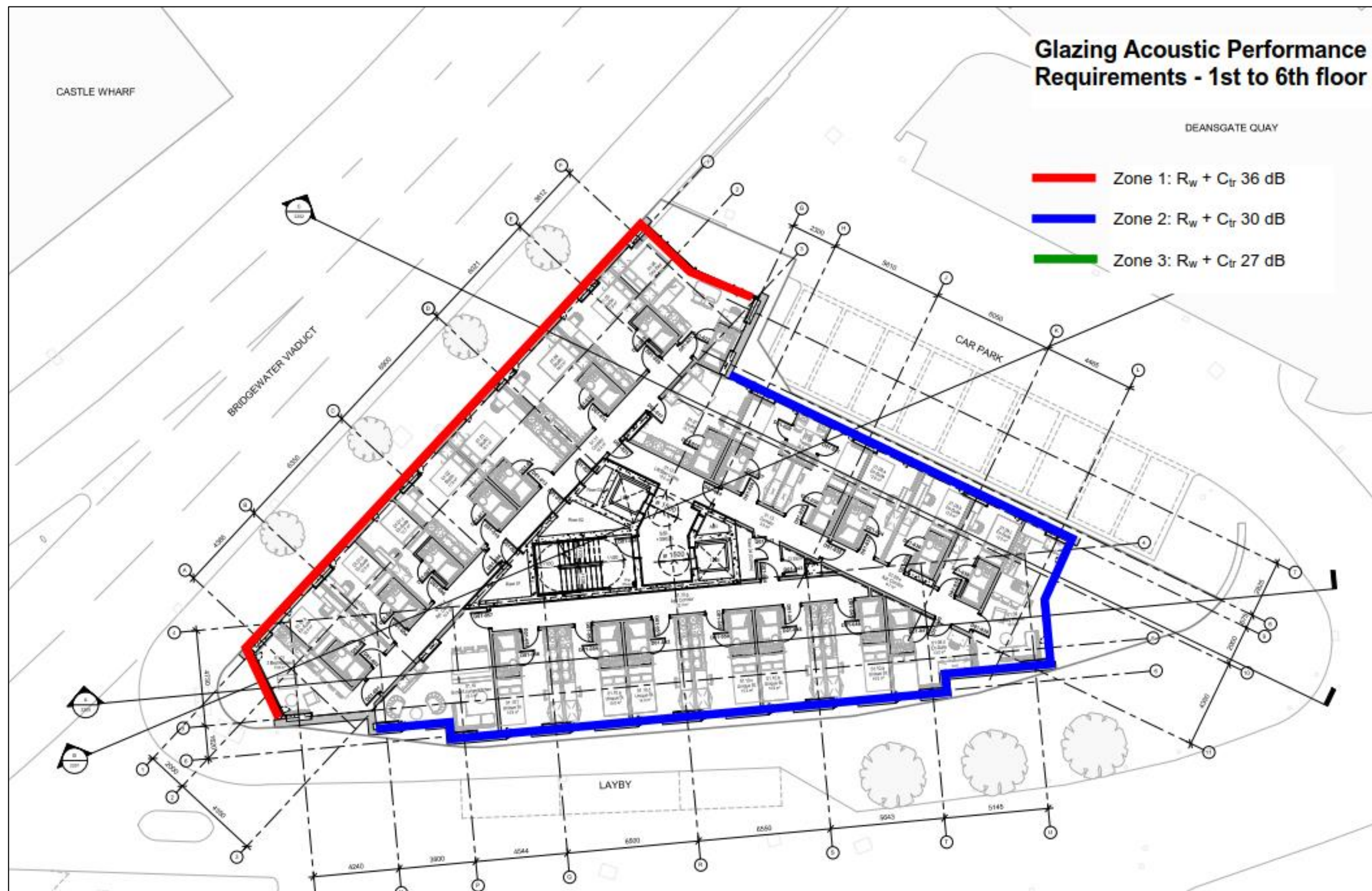


Figure 9: Minimum glazing acoustic performance on the 1st – 6th Floors, Reference 5

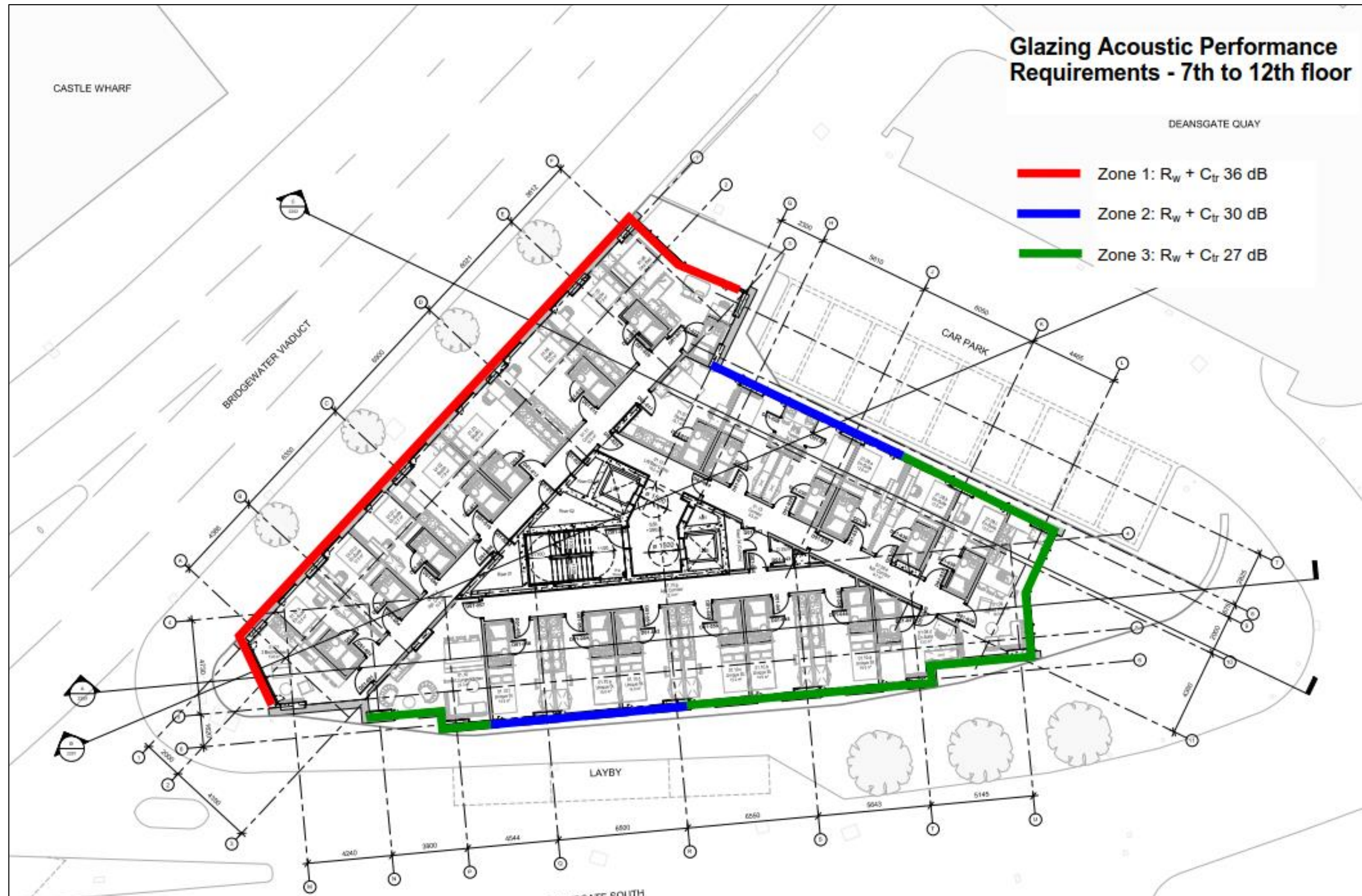


Figure 10: Minimum glazing acoustic performance on the 7th – 12th Floors, Reference 5

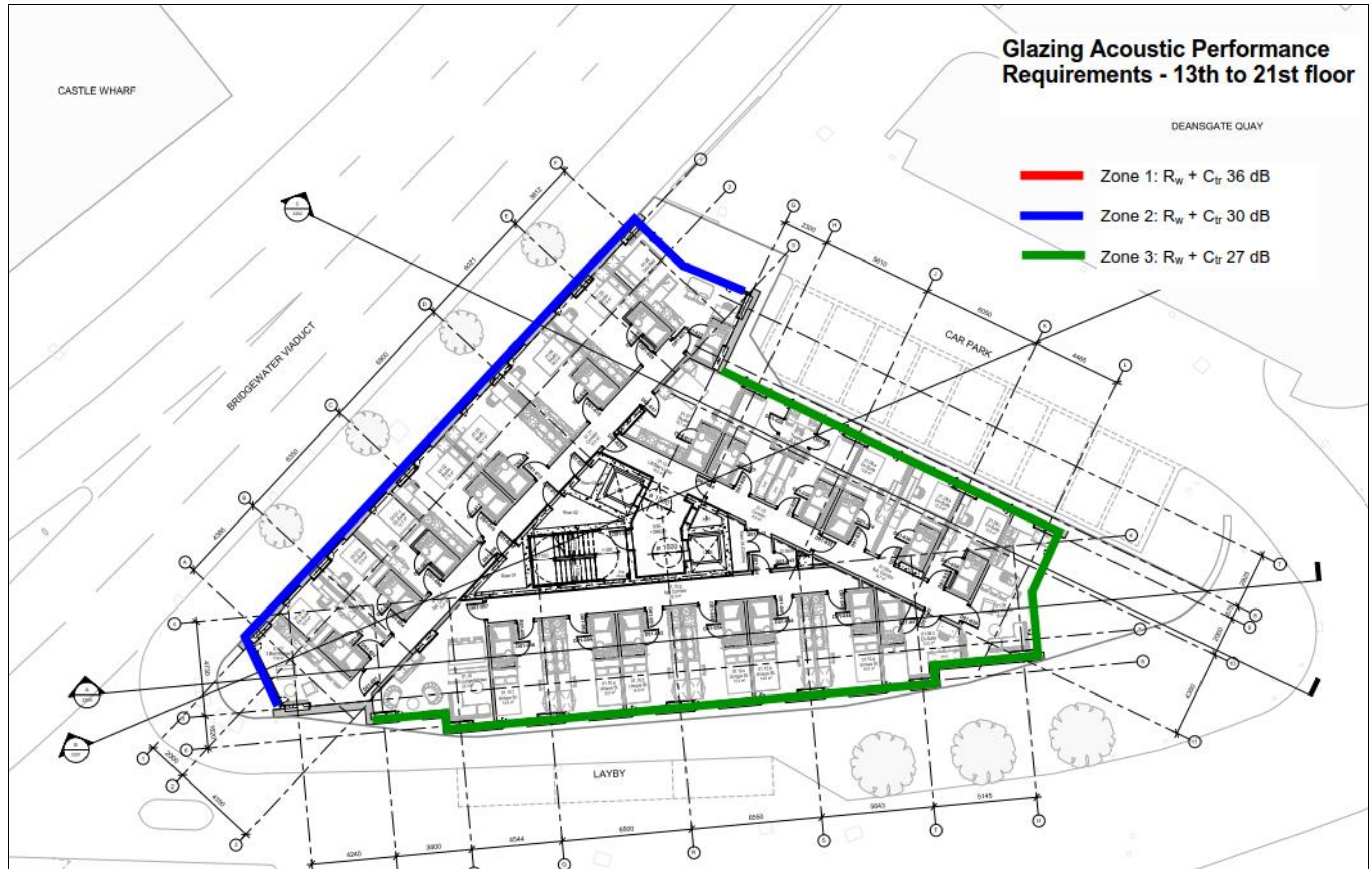


Figure 11: Minimum glazing acoustic performance on the 13th – 21st Floors, Reference 5

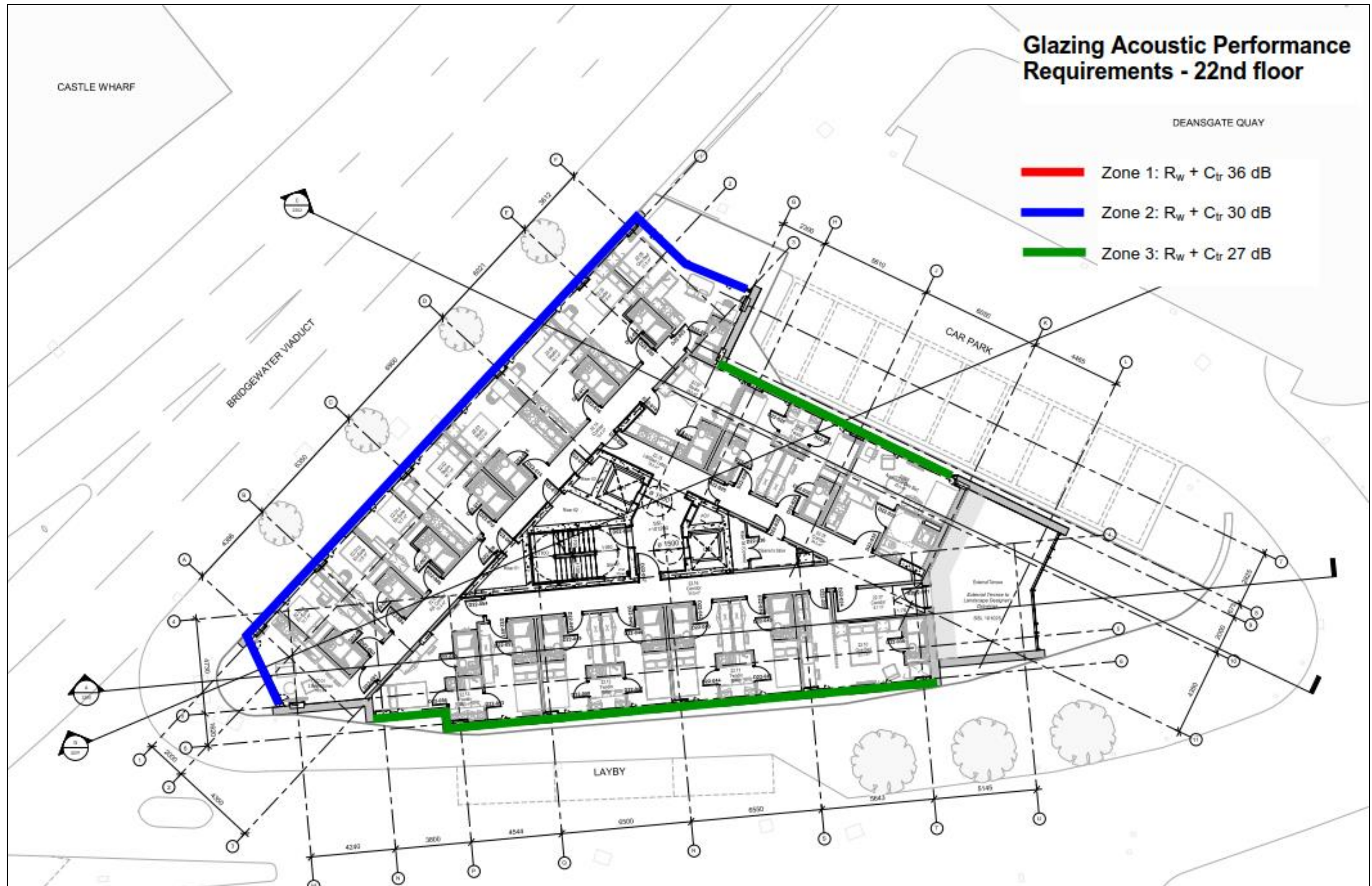


Figure 12: Minimum glazing acoustic performance on the 22nd Floor, Reference 9

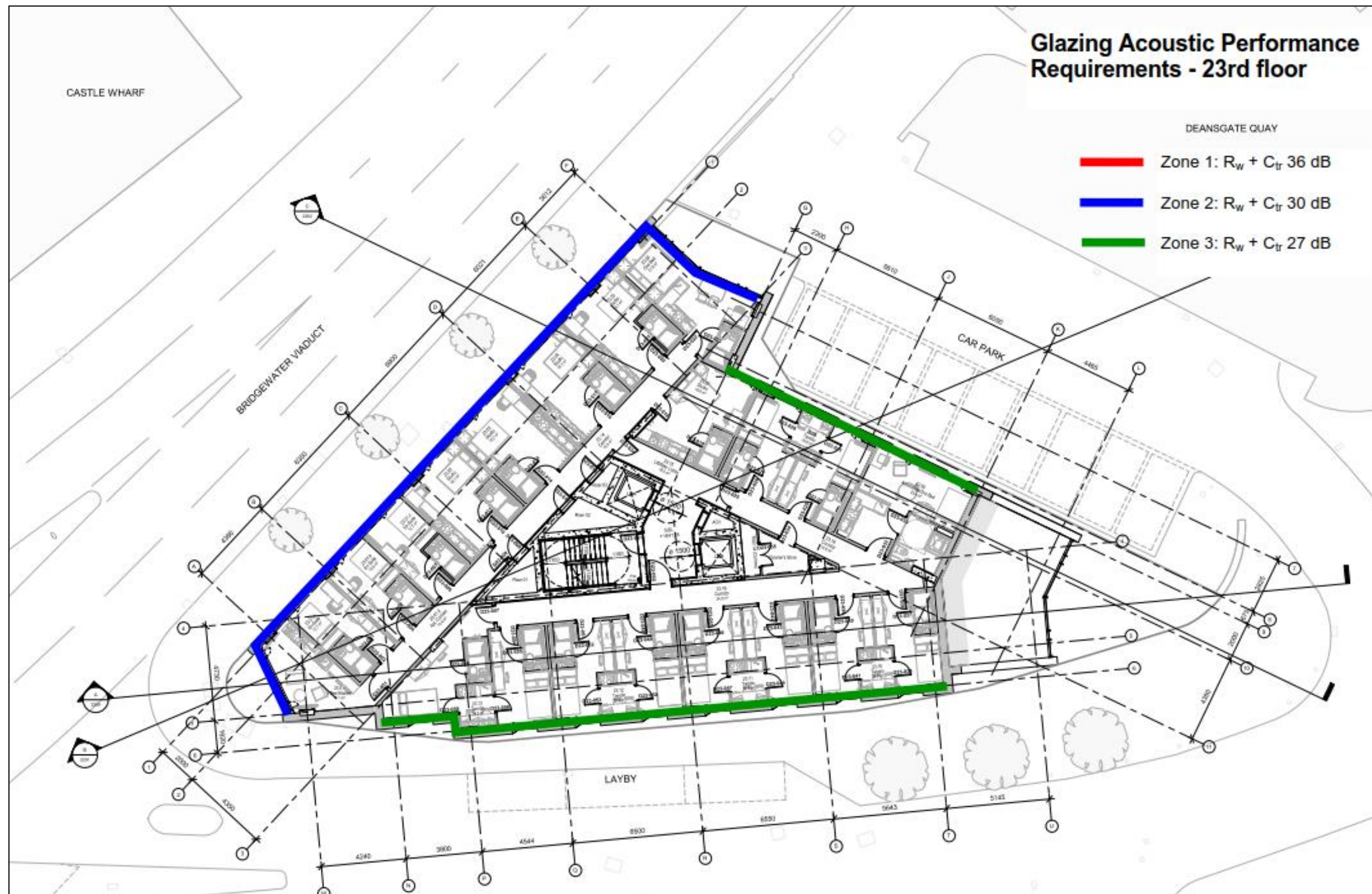


Figure 13: Minimum glazing acoustic performance on the 23rd Floor, Reference 10



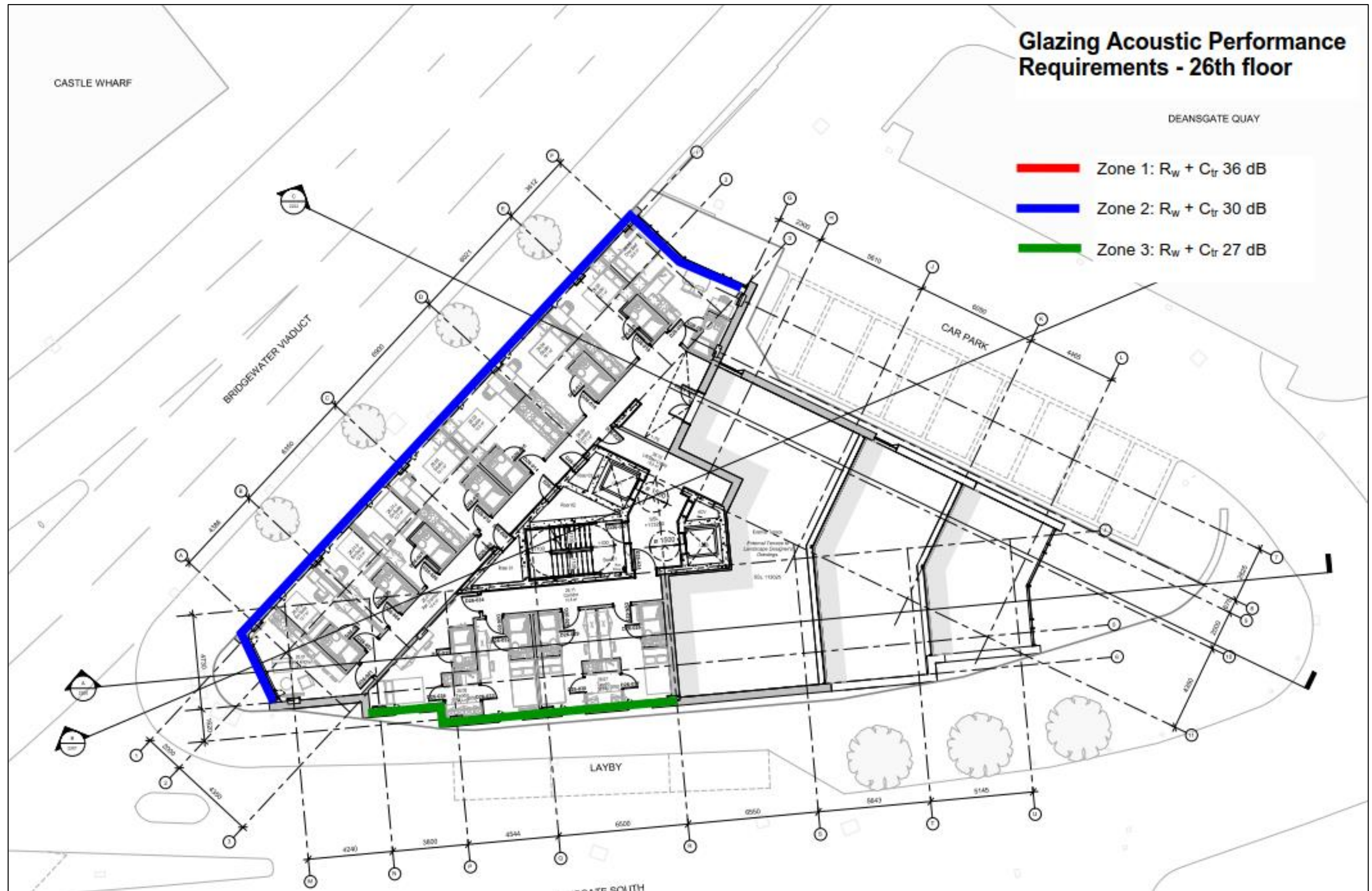


Figure 15: Minimum glazing acoustic performance on the 26th Floor, Reference 12

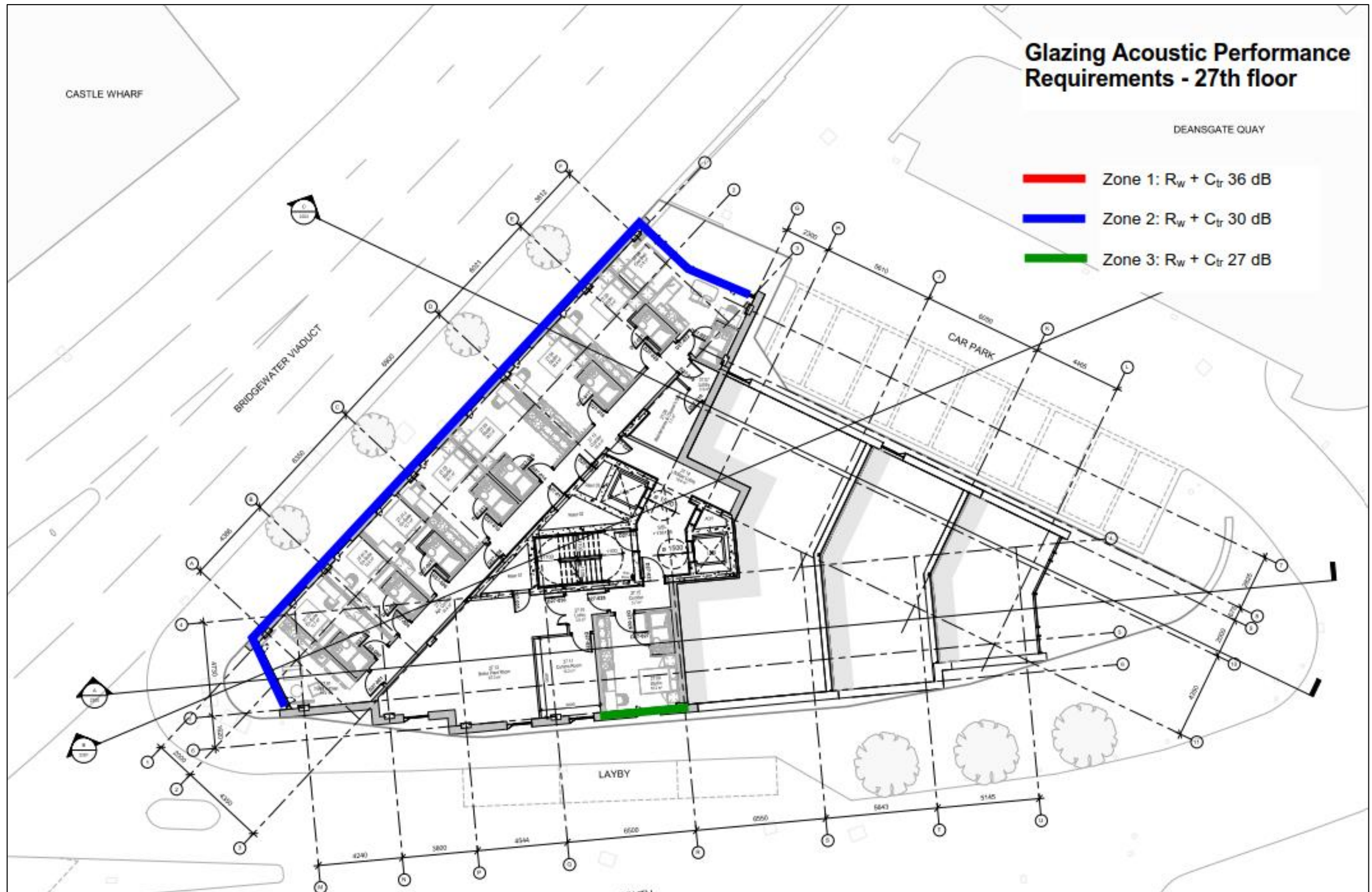


Figure 16: Minimum glazing acoustic performance on the 27th Floor, Reference 13