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PROJECT TECHNICAL MEMORANDUM

Project	:	**Victoria House, Manchester**
Our Ref	:	28367-PTM4-JLS-R0
Date	:	30 June 2021
Author		Joe Sinker, Principal Consultant
Issued to	:	DOMIS & Design Team

RE: PLANNING CONDITION 16 FAÇADE SOUND INSULATION

1.0 Planning Condition 36

This memorandum outlines the project's scheme for acoustically insulating the residential accommodation against external noise in accordance with Planning Condition 16, which states:

"*Before the development commences a scheme for acoustically insulating and mechanically ventilating the residential accommodation against noise from adjacent roads and the adjacent tram and any mitigating vibration and reradiated noise levels associated with the operation of the adjacent tram line shall be submitted to and approved in writing by the City Council as local planning authority.*

The approved noise insulation scheme and vibration and reradiated noise mitigation measures shall be completed before any of the dwelling units are occupied.

The following noise criteria will be required to be achieved:
Bedrooms (night time - 23.00 - 07.00) 30 dB LAeq (individual noise events shall not exceed 45 dB LAmax,F by more than 15 times)
Living Rooms (daytime - 07.00 - 23.00) 35 dB LAeq
Gardens and terraces (daytime) 55 dB LAeq

Prior to occupation a post completion report to verify that all of the recommended mitigation measures have been installed and effectively mitigate any potential adverse noise impacts in the residential accommodation shall be submitted and agreed in writing by the City Council as local planning authority. Prior to occupation any non compliance shall be suitably mitigated in accordance with an agreed scheme."

2.0 Prevailing Noise Climate

A detailed environmental noise and vibration survey of the site was undertaken by Hydrock in 2018 (pre COVID). The methodology and results are presented in the Noise Chapter of the Environmental Statement prepared for the scheme's full planning application.

Validation measurements were undertaken by Hann Tucker Associates at various street level positions around the site between 05:00 and 12:00 hours on Monday 8 March 2021. With consideration for the ongoing effects of COVID-19 it was found that the measured noise levels were congruent with those measured by Hydrock at planning stage.

The external noise climate was noted to be dominated by road traffic on Great Ancoats street and the surrounding road network. Through analysis of their vibration survey data Hydrock concluded that no specific mitigation measures should be required to control re-radiated noise from tram movements.

3.0 External Noise Intrusion Assessment

An assessment has been carried out in accordance with BS 8233's rigorous calculation method (as per below equation) to determine the sound reduction performance requirements of residential facades.

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

The assessment considers the habitable room layouts and façade dimensions of the latest architectural drawings at the time of writing.

Incident external noise levels onto facades have been determined by use of 3D noise mapping software, calibrated to surveyed noise levels presented in the Hydrock Acoustic Report. A screenshot of the model is presented below. Consideration is given to screening/reflections from neighbouring buildings, including those still under construction at time of writing.

CadnaA Site Noise Model (dB, Daytime $L_{Aeq,16hr}$)

4.0 Design Proposals

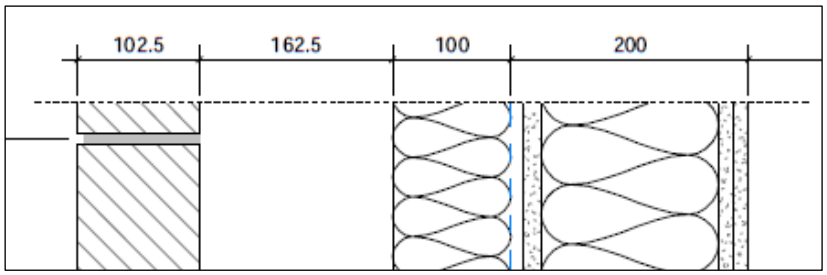
Residential facades between Level 01 and Level 23 shall comprise aluminium-framed window systems (comprising vision glass, spandrels, louvres) punched in to brick/SFS walls, as below.

Windows/Cladding: Aluminium framed double-glazed windows/doors with louvred purge ventilation panel.

Roofs: 200mm+ in-situ concrete slab.

Ventilation/Cooling: MVHR whole dwelling ventilation. Minimal reliance on façade openings for ventilation / overheating control.

External Walls: Levels 01-23: Traditional brickwork, 170mm+ cavity insulated with 150mm mineral wool, 15mm sheathing board, 150mm fully insulated SFS, 2 x 12.5mm plasterboard lining. See below.



For the purpose of further calculation we have considered the following sound reduction performance for the external wall construction. These figures have been derived using INSUL 'sound reduction' software and our in-hose database of published performance test results for similar build ups.

Element	Min. Sound Reduction, R (dB) at Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	4k
External Wall	45	50	55	60	65	65

At Level 24 only residential facades will comprise full height curtain walling.

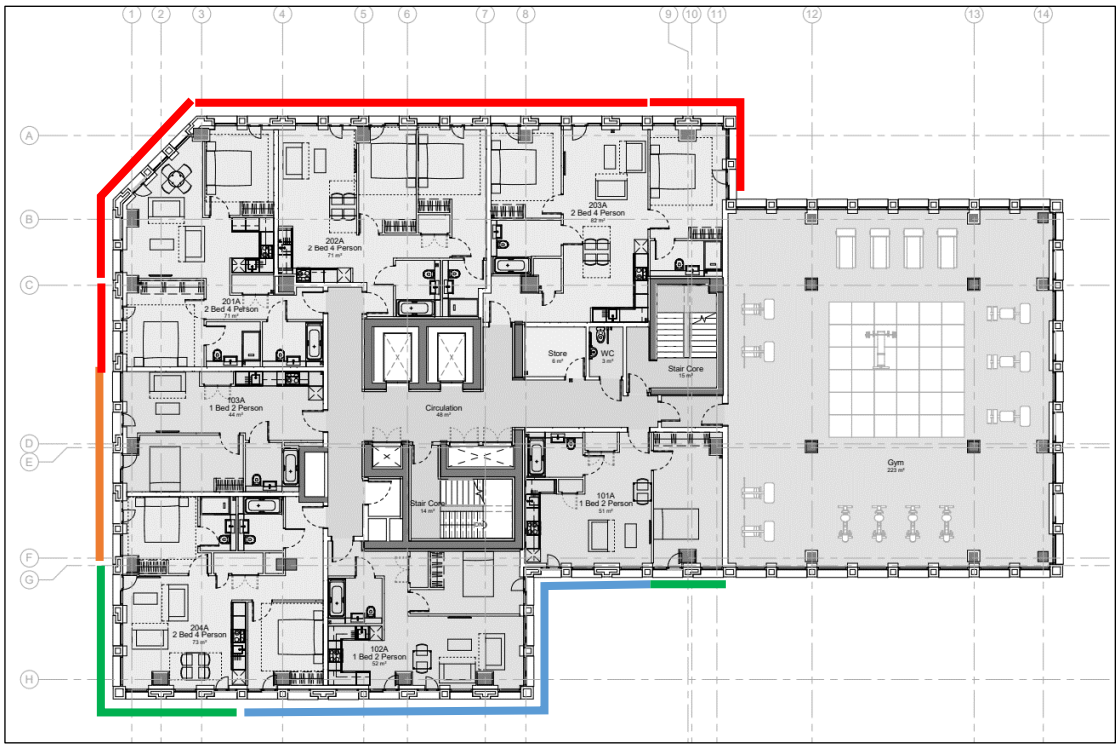
5.0 Sound Reduction Performance Specification for Framed (Window) & CW Systems

Residential Facades

The following table presents the minimum octave band sound reduction performance requirements for the window/cladding systems. In all cases, it is essential that the system is tested in accordance with BS EN ISO 10140-2 and that the octave band specifications are met by the system as a whole (i.e. the complete assembly – i.e. the frame, glass, spandrel panels, seals, etc. – and not just the glass).

Spec Ref.	Colour Zone*	Minimum Sound Reduction Index (dB) at Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
A	BLUE	20	20	24	31	35	38	38
B	GREEN	22	24	27	34	38	41	41
C	ORANGE	24	26	31	37	40	44	44
D	RED	26	28	34	40	43	46	46

*Ref. sketch zone plans below



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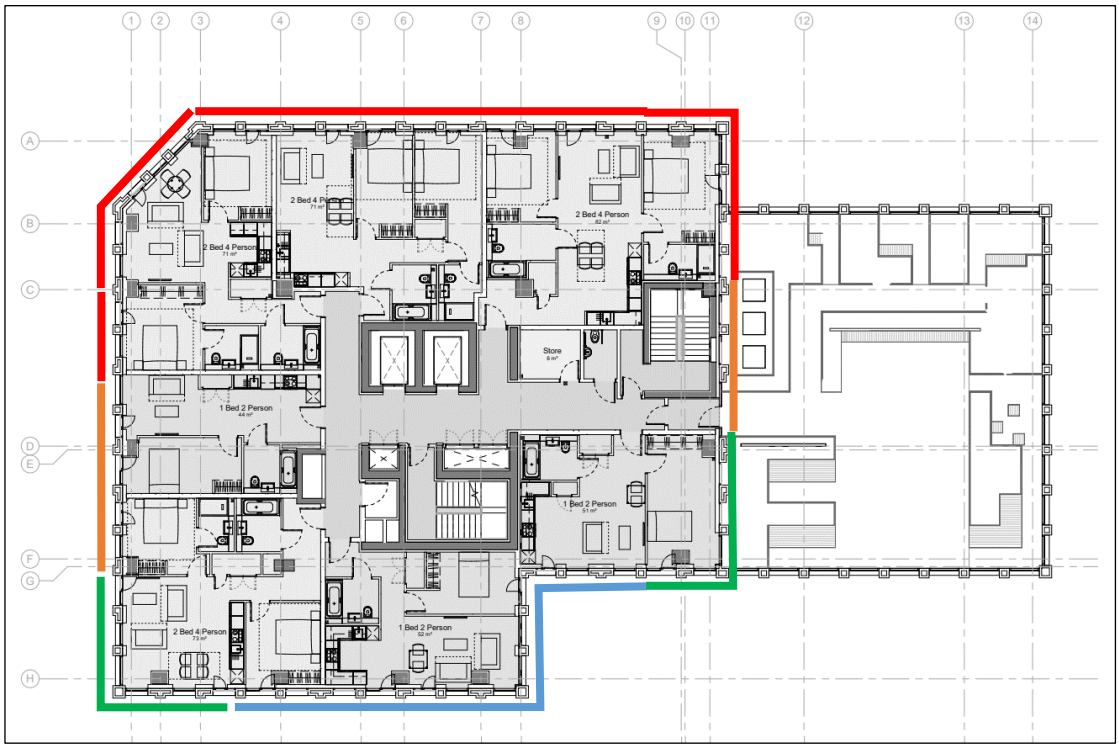
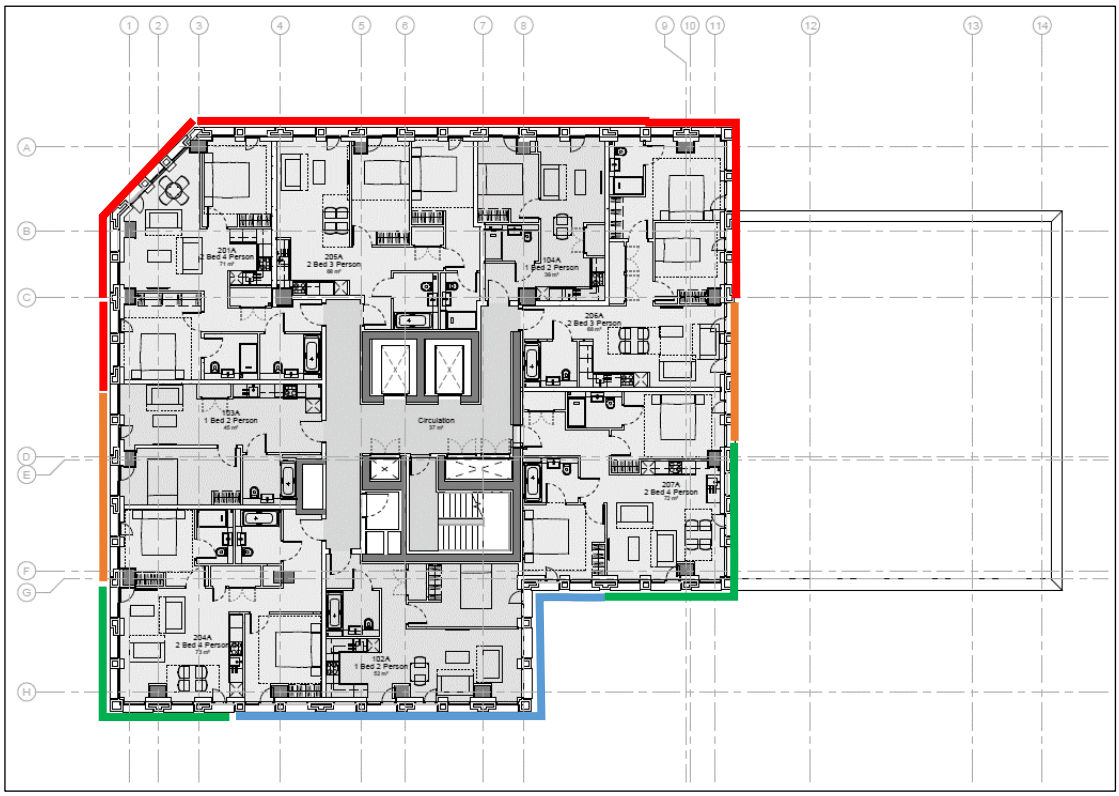
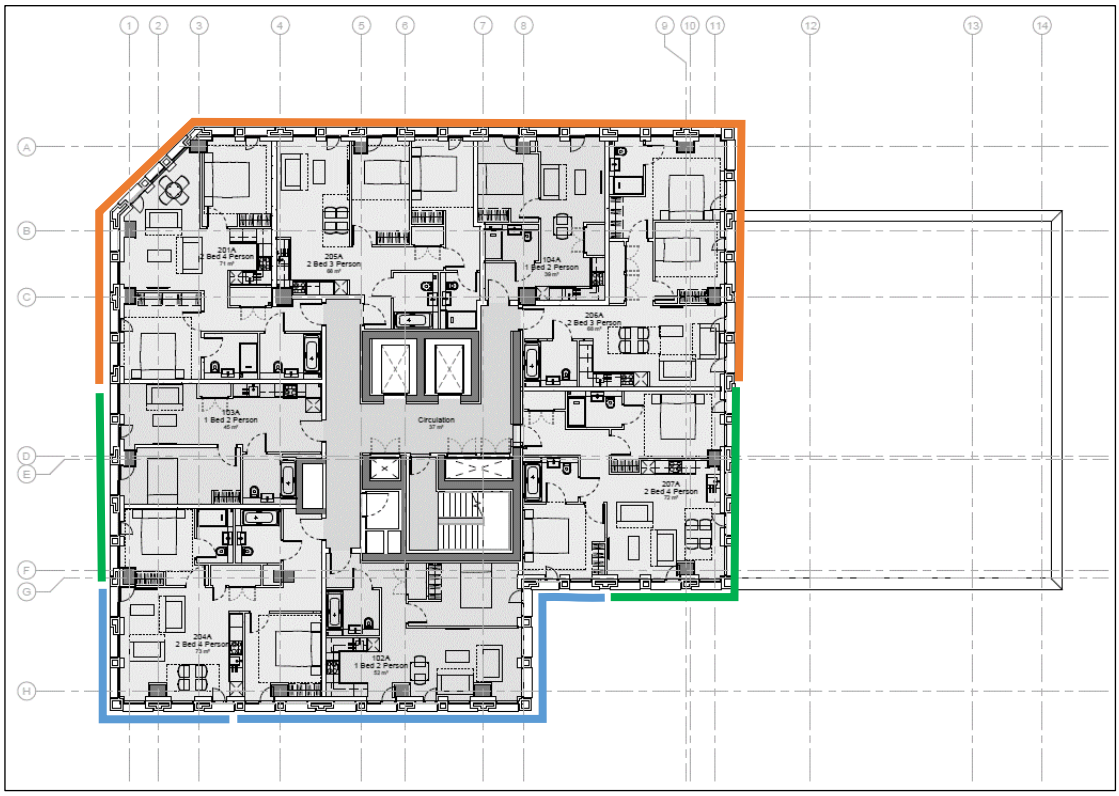


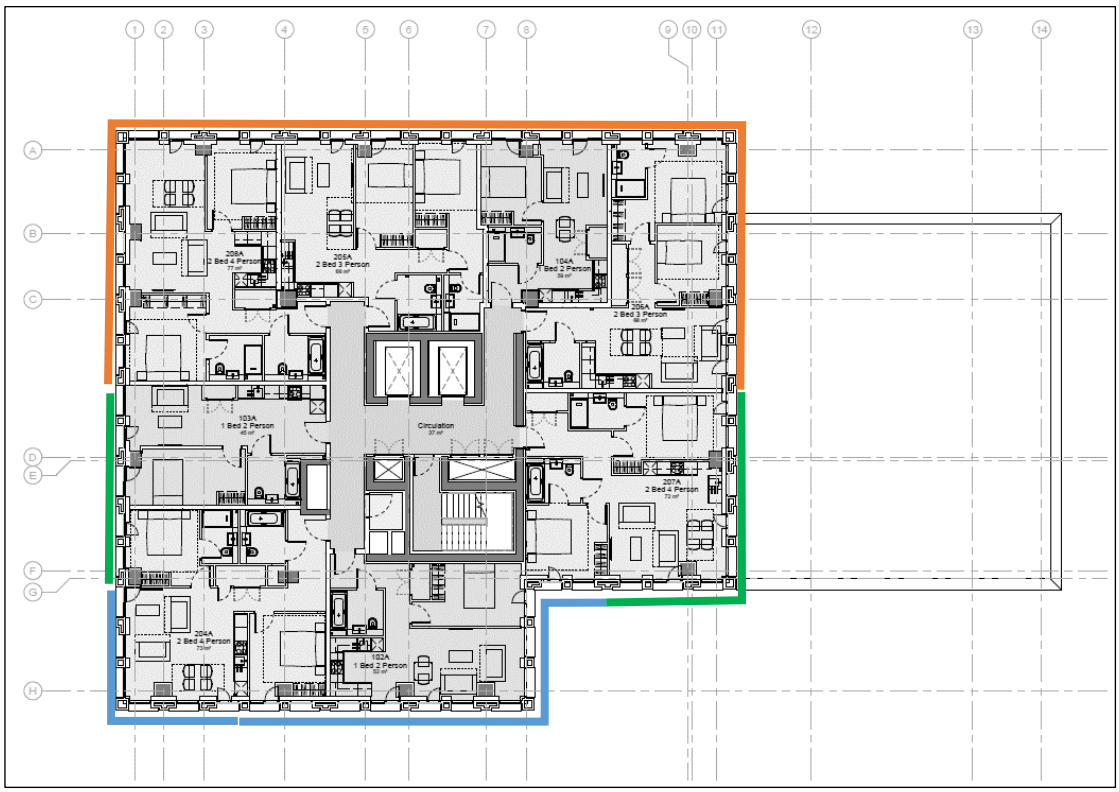
Level 02



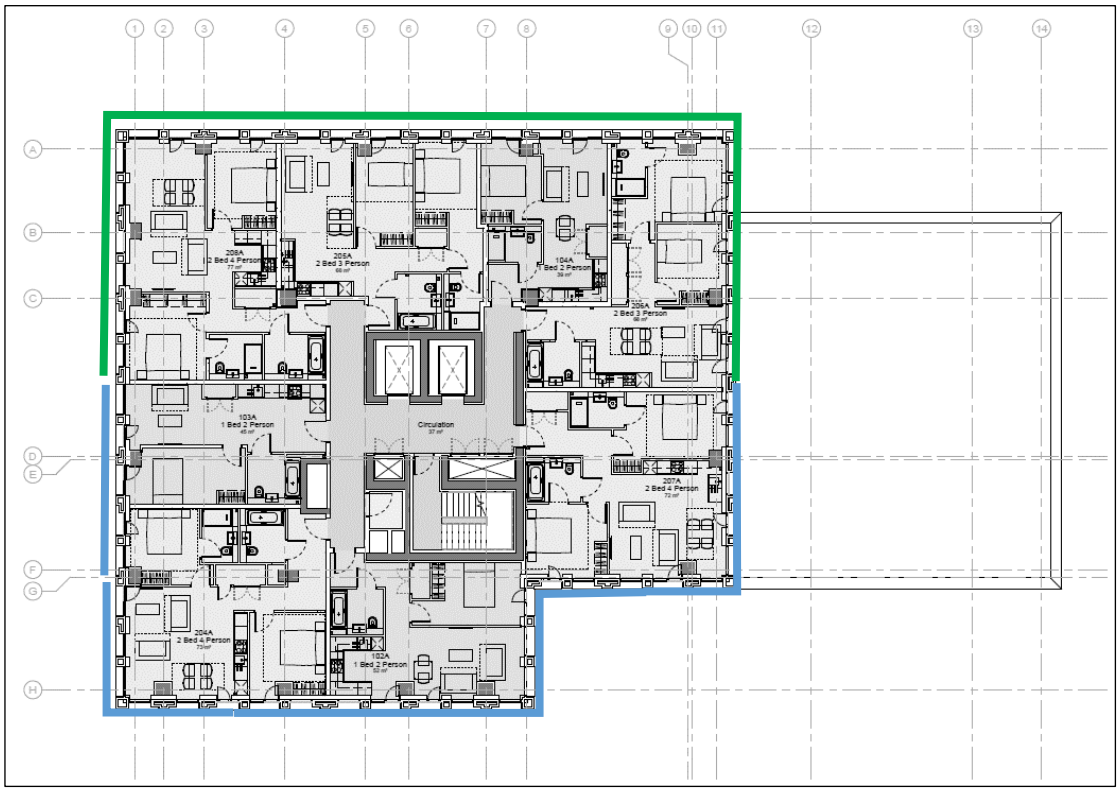
Level 03 – Level 06



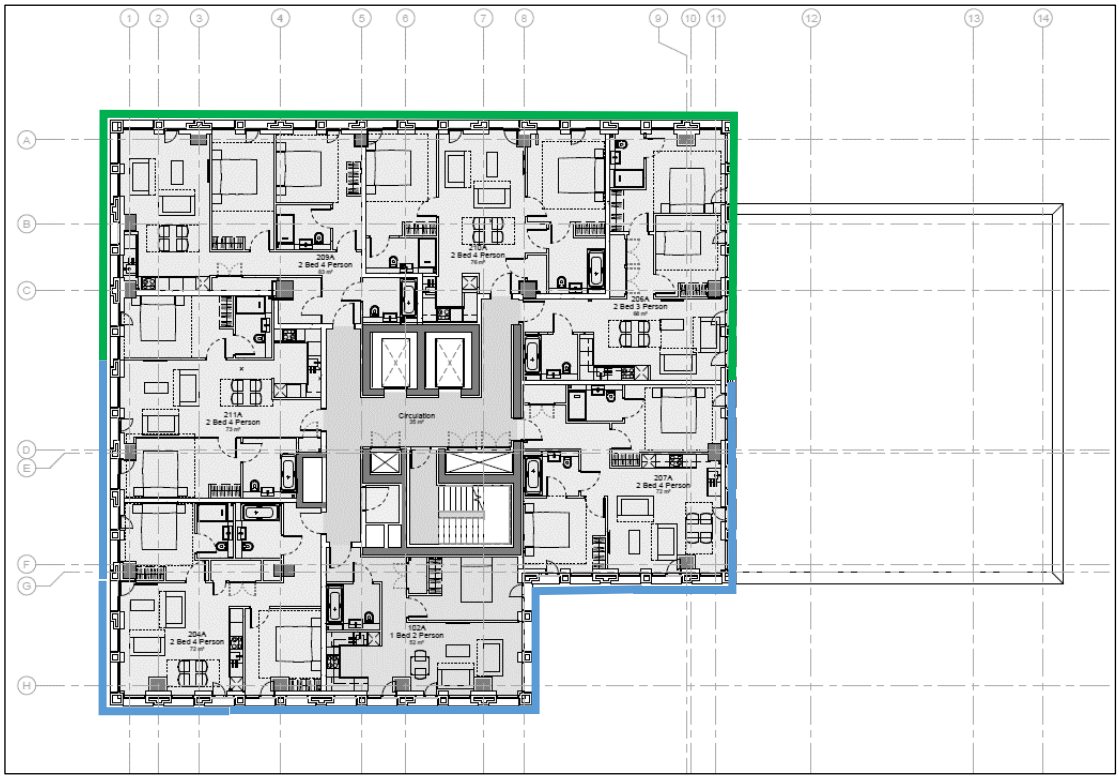
Level 07 – Level 08



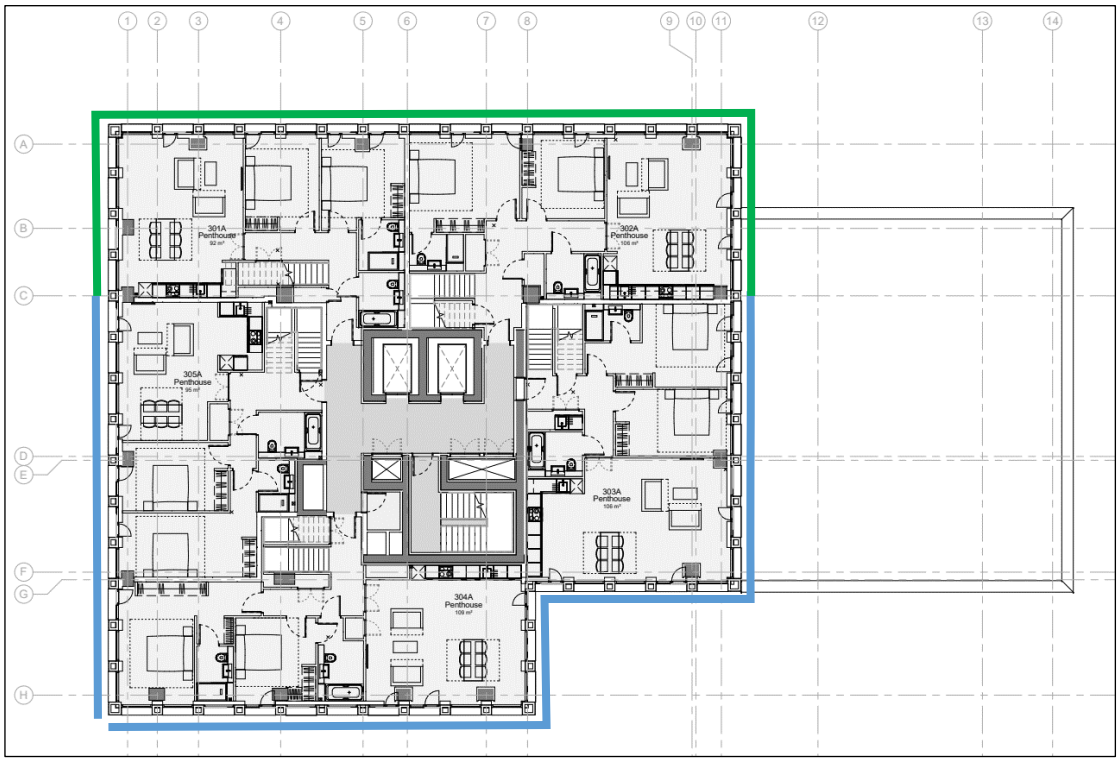
Level 09 – Level 14



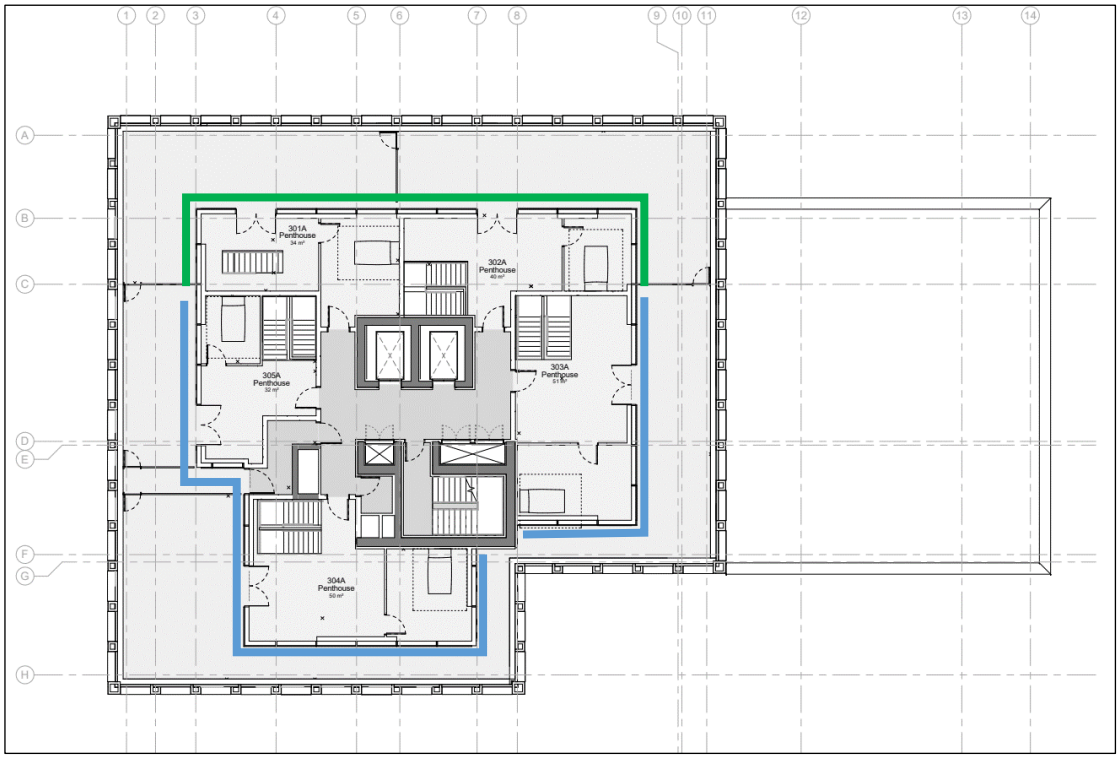
Level 15 – Level 18



Level 19 – Level 22



Level 23



Level 24

To non-residential areas, we would recommend the windows/cladding are designed to satisfy the relevant sound reduction indices as per the below.

Retail Units: Type C

Residential Entrance: Type C

Gym: Type C

BoH: N/A

6.0 Design Guidance

It is essential that prospective cladding/window system suppliers can demonstrate complete assemblies comply with the acoustic performance detailed in our specification rather than simply offering a generic frame and glazing configurations. However, for guidance, we would suggest that the following glass configurations could typically be expected to provide the required levels of sound insulation.

Spec Ref.	Colour Zone	Example Glazing Configuration
A	**BLUE**	8 mm / 16 mm / 4 mm
B	**GREEN**	8 mm / 16 mm / 6.4 mm (lam)
C	**ORANGE**	10 mm / 16 mm / 8.8 mm (Ac lam)
D	**RED**	10.8 mm (Ac lam) / 16 mm / 8.8 mm (Ac lam)

Purge vent door panels will be capable of maintaining the acoustic integrity of the complete cladding system when in the closed position, i.e. during normal ventilation conditions.

7.0 Sample Calculations

The parameters used within our assessment for 'typical' apartments are presented below, followed by a selection of corresponding sample calculations.

Term	Derivation	Bedroom (m^2)	Living Room (m^2)
S_f	Façade area	9.5	9.7
S_{wi}	Cladding (window) area	6.5	6.8
S_{ew}	External wall area	$S_f - S_{wi}$	$S_f - S_{wi}$
-	Room floor area	16.1	26.0

North Elevation– Bedroom (Night-time L_{Amax})

Desc.	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{max,ff}$	80	80	78	84	80	77	87 dB L_{Amax}
External wall, R_{ew}	45	50	55	60	65	65	-
Window/Cladding, R_{wi}	28	34	40	43	46	46	RED SPEC
+10 x log(S/A)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	
+3	3	3	3	3	3	3	
Internal noise level, $L_{max,2}$	52	46	37	41	33	31	**45 dB L_{Amax}**

North Elevation– Living Room (Daytime $L_{Aeq,16hr}$)

Desc.	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	71	67	65	65	62	56	69 dB L_{Aeq}
External wall, R_{ew}	45	50	55	60	65	65	-
Window/Cladding, R_{wi}	26	31	37	40	44	44	ORANGE SPEC
+10 x log(S/A)	-3.7	-3.7	-3.7	-3.7	-3.7	-3.7	
+3	3	3	3	3	3	3	
Internal noise level, $L_{eq,2}$	43	34	26	23	16	10	**31 dB L_{Aeq}**

West Elevation– Bedroom (Night-time $L_{Aeq,8hr}$)

Desc.	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	63	59	57	57	54	48	61 dB L_{Aeq}
External wall, R_{ew}	45	50	55	60	65	65	-
Window/Cladding, R_{wi}	24	27	34	38	41	41	GREEN SPEC
+10 x log(S/A)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	
+3	3	3	3	3	3	3	
Internal noise level, $L_{eq,2}$	39	32	23	19	13	7	**27 dB L_{Aeq}**

East Elevation–Bedroom (Night-time $L_{Aeq,8hr}$)

Desc.	Octave Band Centre Frequency (Hz)						Single Figure
	125	250	500	1k	2k	4k	
External noise level, $L_{eq,ff}$	60	56	54	54	51	45	58 dB L_{Aeq}
External wall, R_{ew}	45	50	55	60	65	65	-
Window/Cladding, R_{wi}	20	24	31	35	38	38	BLUE SPEC
+10 x log(S/A)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	
+3	3	3	3	3	3	3	
Internal noise level, $L_{eq,2}$	40	32	23	19	13	7	**28 dB L_{Aeq}**

For and on behalf of
HANN TUCKER ASSOCIATES

Joe Sinker