

fisher acoustics

Crown St, Phase 2, Manchester

Façade Sound Insulation

September 2020

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Flint Glass Works, 64 Jersey Street, Manchester, M4 6JW

0161 605 0905 

info@fisheracoustics.co.uk 

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CLIENT RENAKER BUILD LTD
1ST FLOOR
NQ BUILDING
47 BENGAL STREET
MANCHESTER
M4 6BB

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AUTHOR MATT FISHER, BENG (HONS) CENG MIOA

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1.0 INTRODUCTION

Renaker Build Limited has been awarded planning approval for a mixed-use development at Crown Street, Phase 2, Manchester. Phase 2 of the Crown Street development includes two residential towers (C4 and C5) and a two-deck common podium with associated underground car parking over three basement levels. The podium will house amenity space and commercial units.

Tower C4 is to be constructed as part of Phase A of the overall construction works. Tower C5 is to be constructed as part of Phase B of the overall construction works.

In addition, outline planning permission has been granted for a single-form entry primary school (Use Class D1).

Fisher Acoustics has been appointed by Renaker Build Limited to conduct an intrusive noise study relating to the proposals for Crown Street, Phase 2 with a view to identifying the minimum recommended acoustic performance of façade elements to habitable rooms to achieve appropriate internal noise levels within the proposed residential accommodation.

This report summarises the results of environmental noise surveys at the site and the determination of the required sound insulation performance of façade elements to achieve the required internal noise criteria.

2.0 INTERNAL NOISE CRITERIA

The planning approval for Crown Street Phase 2 includes conditions relating to noise ingress to the residential accommodation within Phase A (Tower C4) as follows:

- 19a. Prior to the commencement of development within Phase A, a scheme for acoustically insulating the proposed residential accommodation against noise from the Mancunian Way and Chester Road 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 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)	Designed to achieve the lowest practicable levels.

- 19b. The approved noise insulation scheme shall be completed and a post-completion verification report (including validation that the work undertaken throughout the development conforms to the recommendations and requirements of the acoustic report approved under part a. above and including the results of post-completion testing to confirm that the internal noise criterion have been met) shall be submitted to and approved in writing by the City Council as local planning authority before any of the dwelling units within Phase A are first occupied. Any instances of non-conformity with the approved acoustic report shall be detailed within the post-completion report along with any measures required to ensure compliance with internal noise criteria. Those measures shall be implemented in full before any of the dwelling units within Phase A are first occupied.



Similarly, the planning approval for Crown Street Phase 2 includes conditions relating to noise ingress to the residential accommodation within Phase B (Tower C5) as follows:

- 57a. Prior to the commencement of development within Phase B, a scheme for acoustically insulating the proposed residential accommodation against noise from the Mancunian Way and Chester Road 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 LAeq (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 LAeq
Gardens and terraces (daytime)	Designed to achieve the lowest practicable levels.

- 57b. The approved noise insulation scheme shall be completed and a post-completion verification report (including validation that the work undertaken throughout the development conforms to the recommendations and requirements of the acoustic report approved under part a. above and including the results of post-completion testing to confirm that the internal noise criterion have been met) shall be submitted to and approved in writing by the City Council as local planning authority before any of the dwelling units within Phase B are first occupied. Any instances of non-conformity with the approved acoustic report shall be detailed within the post-completion report along with any measures required to ensure compliance with internal noise criteria. Those measures shall be implemented in full before any of the dwelling units within Phase B are first occupied.

The internal noise criteria given in conditions 19 and 57 are those detailed in BS8233: 2014 and World Health Organisation guidance, as discussed below.

BS8233: 2014 'Guidance on sound insulation and noise reduction for buildings' provides appropriate criteria for acceptable levels of noise ingress within habitable rooms.

In particular, section 7.2.2 'Internal ambient noise levels in dwellings' of BS8233: 2014 states that 'In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 4'. Table 1 identifies the guideline values.

BS8233: 2014 – Indoor ambient noise levels for dwellings			
Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB LAeq, 16 hours	-
Dining	Dining room / area	40 dB LAeq, 16 hours	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16 hours	30 dB LAeq, 16 hours

Table 1: BS8233: 2014 intrusive noise criteria

Note 7 of section 7.2.2 of BS8233: 2014 states: 'Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed up to 5 dB and reasonable internal conditions still achieved'.

With regard to maximum night time noise levels within bedrooms, BS8233: 2014 states 'Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LA_{max,f} depending on the character and number of events per night. Sporadic noise events could require separate values'.

In the absence of a specific performance criterion within BS8233: 2014 for short-term noise maxima, reference can be made to guidance published by the World Health Organisation (WHO). In particular, the WHO publication 'Guidelines for Community Noise' (1999), from which the guidance given in BS8233: 2014 is itself derived, states that '*for a good sleep, it is*

believed that indoor sound pressure levels should not exceed approximately 45 dB LA_{max} more than ten to fifteen times per night’.

‘Planning & Noise, Technical Guidance’ was issued in December 2015 by the Environmental Protection, Environmental Health and The Neighbourhoods Service sections of Manchester City Council. The document provides guidance to applicants and consultants concerning the assessment and prediction of environmental noise associated with a particular development. Reference is also made in the document to the relevant supporting information and guidance documents that Developers are expected to refer to when submitting a planning application.

‘Planning & Noise, Technical Guidance’ refers to the following guidance documents:

- BS 8233 (2014) Guidance on sound insulation and noise reduction for buildings
- WHO (1999) Guidelines for Community Noise.

With regard to noise ingress to residential dwellings, section 3.5 ‘National & International Standards’ of the document states that, consultants should ‘not base their assessment on the 5dB relaxation’ [described in Note 7 of section 7.2.2 of BS8233: 2014]. This is reflected in the noise criteria given in conditions 19 and 57 for Crown Street Phase 2 development.

Notwithstanding the above, Technical Note T01A-PR0634-MPF, dated 15 May 2020 issued by Fisher Acoustics Ltd, presents a case for a relaxation of 5dB in the daytime internal noise criterion, from 35dB LA_{eq} to 40dB LA_{eq}. The Technical Note has been issued to Manchester City Council for consideration.

The following internal noise criteria due to external noise sources have subsequently been targeted:

- | | | |
|-----------------|--|--|
| ▪ Living Rooms: | Daytime (0700-2300 hrs) | 38dB LA _{eq} |
| ▪ Bedrooms: | Daytime (0700-2300 hrs) | 35dB LA _{eq} |
| ▪ Bedrooms: | Night time (2300-0700 hrs) | 30dB LA _{eq} , 45dB LA _{max} |
| | (fifteen excesses over 45dB LA _{max} allowed per night) | |

These criteria have formed the basis of the assessment discussed herein.

3.0 ENVIRONMENTAL NOISE SURVEY DATA

In order to calculate the minimum recommended sound insulation performance of the external façade elements to achieve the noise criteria identified above, Fisher Acoustics has been provided with external daytime and night time noise survey data gathered by REC Associates during a continuous unattended noise survey over a seven-day period between 14 November 2019 and 21 November 2019. As required by conditions 19 and 57 of the planning permission, the noise data include rush hour traffic periods.

Figure 1 identifies the location of the noise survey measurement position. The measurement microphone was mounted in free-field conditions at a height of four metres above street level to ensure line of sight to both carriageways of the A57(M).

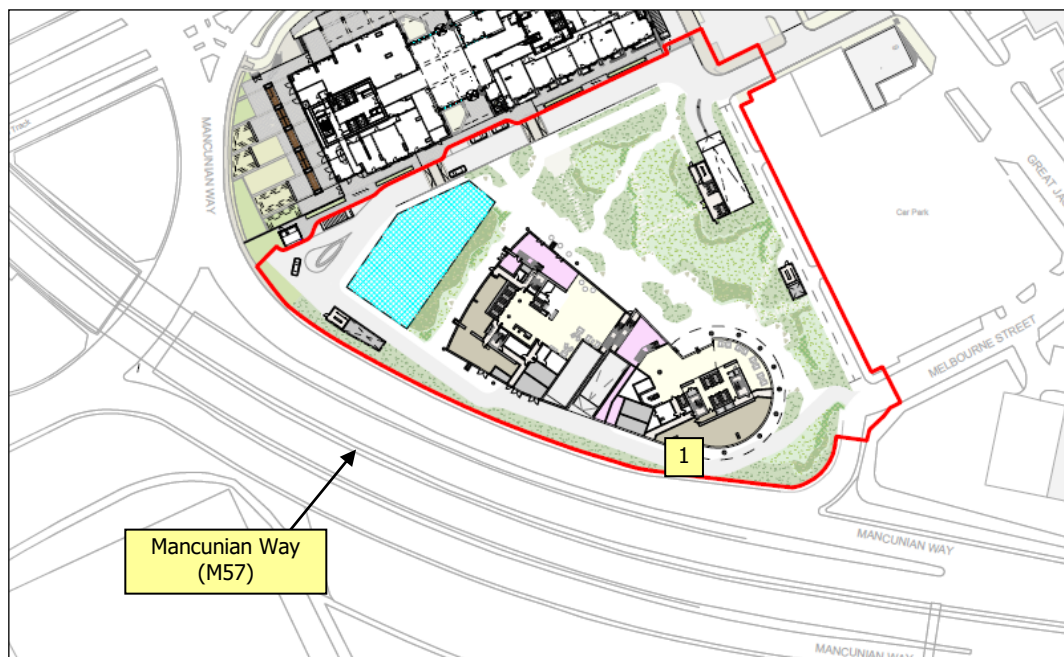


Figure 1: Noise Survey Measurement Location

The noise levels measured during the noise survey are summarised in Table 2.

Measurement Location	Measured Noise Levels			
	Daytime (Defined as 7 am to 11 pm)		Night time (Defined as 11 pm to 7 am)	
	dB, LAeq, 16 hrs	dB, LAmax	dB, LAeq, 8 hrs	dB, LAmax
1	76 to 77	73 to 102	72 to 73	74 to 94

Table 2: Summary of measured environmental noise levels

The quoted average (LAeq) noise levels are the average noise levels measured over the full measurement periods in question at each measurement position. The quoted LAmax noise levels show the range of noise levels measured over the sample periods.

Fisher Acoustics' calculations of external noise ingress have been carried out on the basis that the measured noise survey data are a true representation of the noise levels impacting upon the closest residential floor levels of Towers C4 and C5 to the Mancunian Way (A57(M)).

4.0 NOISE INGRESS

The external noise survey data measured during the REC noise survey have been used to calculate the required sound insulation performance of façade elements to achieve the internal noise criteria within apartment rooms due to external noise. The calculations are based on the 'more rigorous' calculation method identified in Annex G.2.1 of BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'.

The calculations take into account the measured levels of noise at the site, the areas of individual façade elements, (e.g. glazing, curtain wall framing and openable purge vent panels) identified in the drawings submitted for planning purposes and the expected reverberation time of the apartment rooms.

All of the proposed apartments are to be provided with continuously running supply and extract ventilation in order to achieve the background ventilation requirements of Approved Document F of the Building Regulations. Therefore, no passive trickle ventilation openings are required to the external facades of the habitable rooms.

Vision panels

It has been determined that a range of acoustic specifications for the vision panels to the proposed habitable rooms will be required to achieve the recommended internal noise levels. Figures 2 to 7 identify the locations of the various recommended specification types to Tower C4. Figures 8 to 13 identify the locations of the various recommended specification types to Tower C5. Table 3 identifies the minimum recommended Sound Reduction Index of the vision panel types. The recommended performance values in Table 3 relate to the composite performance of the glazing and the curtain wall frame.

Vision Panel Type	Sound Reduction Index (dB) @ Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Type A	27	34	40	44	46	50	57
Type B	25	30	38	43	46	48	55
Type C	23	29	35	40	43	46	53
Type D	21	27	28	35	40	37	40

Table 3: Minimum Recommended Sound Reduction Index of vision panels, including frame

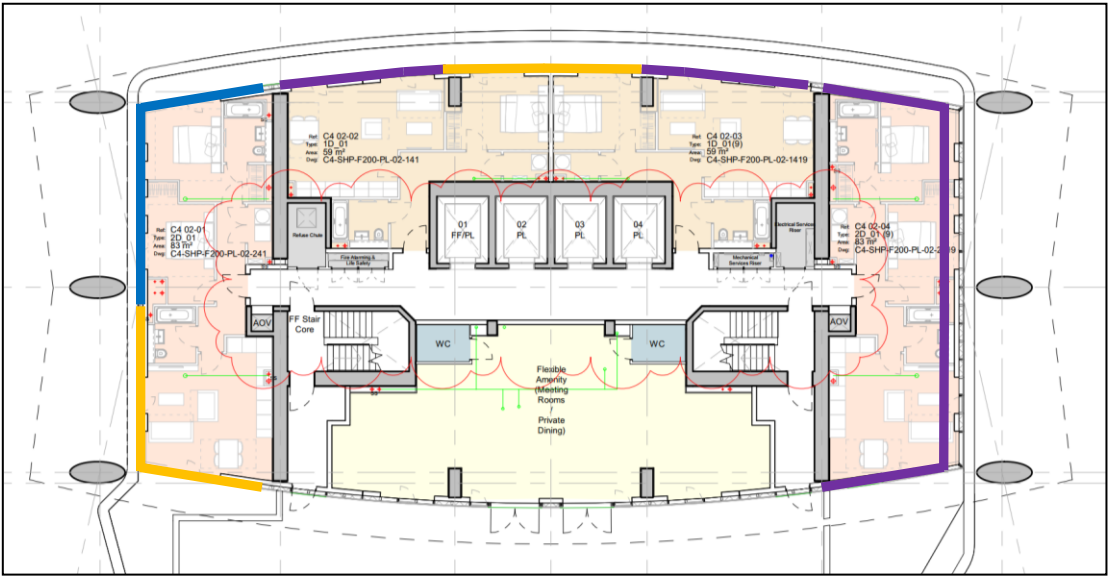


Figure 2: Acoustic Specification Location Plan, Building C4, Level 02 – Vision Panels

KEY

- Type A
- Type B
- Type C
- Type D

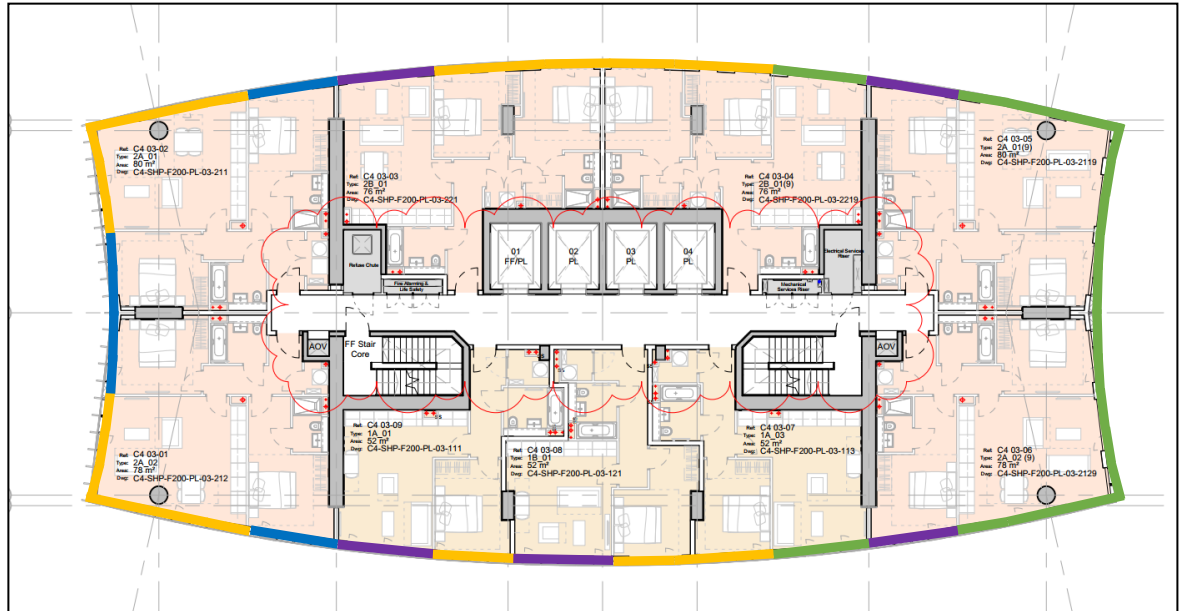


Figure 3: Acoustic Specification Location Plan, Building C4, Level 03 to 20 – Vision Panels

KEY

- | | |
|---|--------|
|  | Type A |
|  | Type B |
|  | Type C |
|  | Type D |

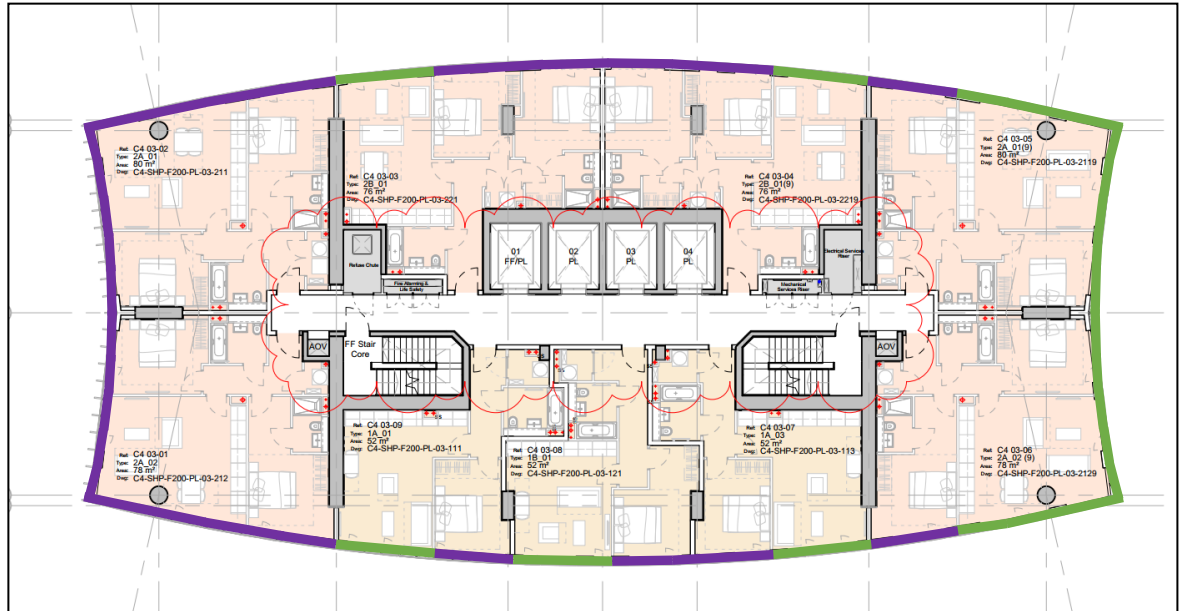


Figure 4: Acoustic Specification Location Plan, Building C4, Level 21 to 45 – Vision Panels

KEY

- | | |
|---|--------|
|  | Type A |
|  | Type B |
|  | Type C |
|  | Type D |

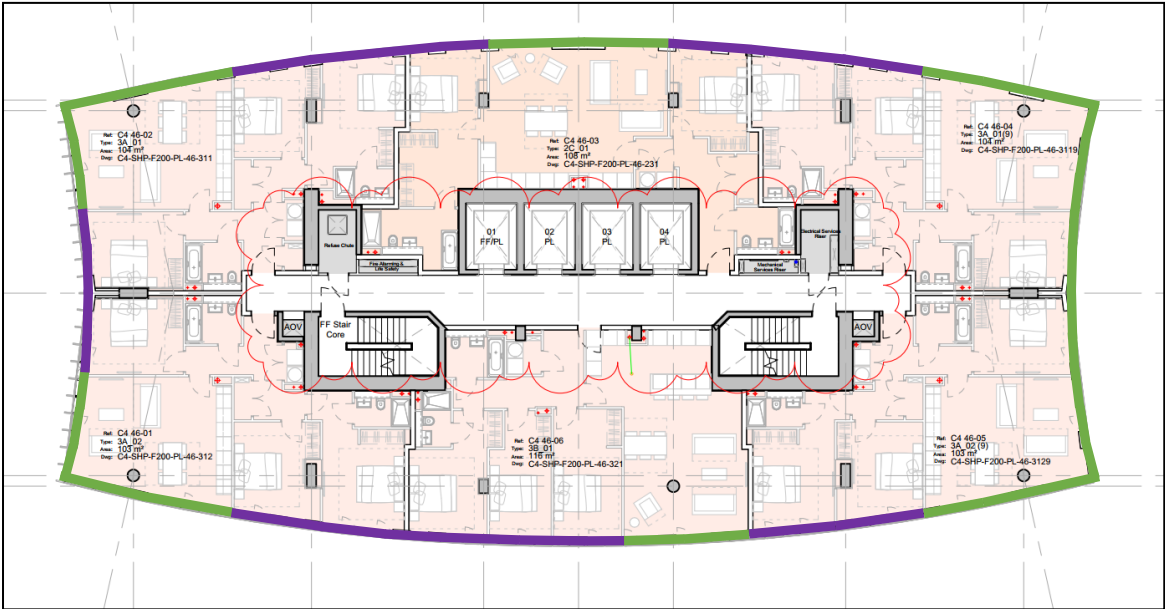


Figure 5: Acoustic Specification Location Plan, Building C4, Level 46 to 48 – Vision Panels

KEY

- Type A
- Type B
- Type C
- Type D

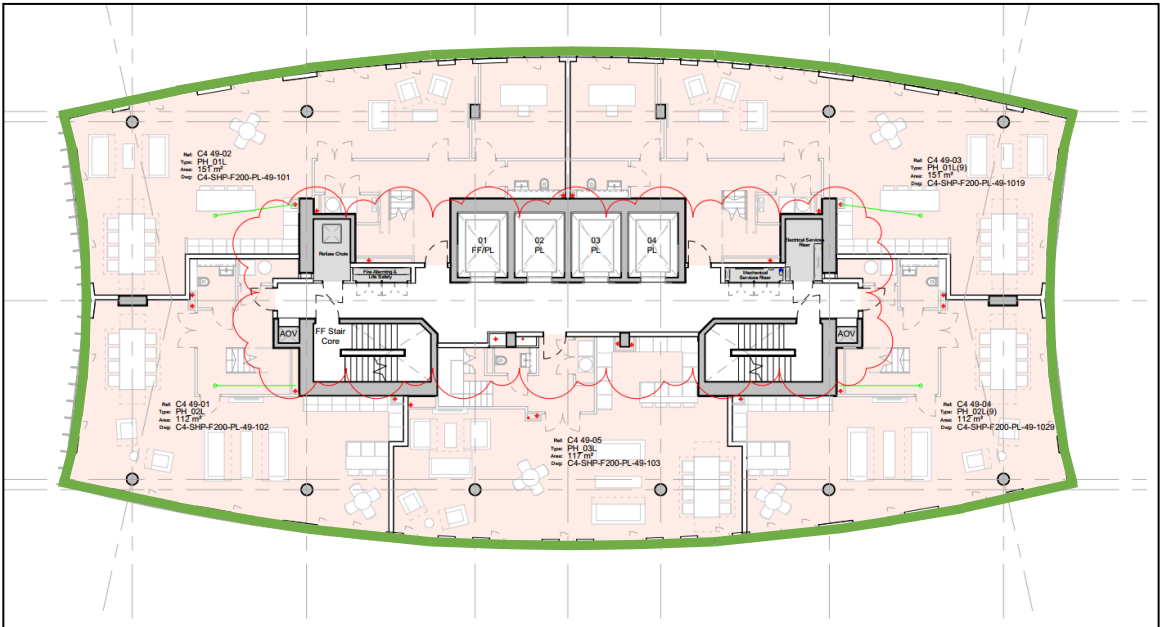


Figure 6: Acoustic Specification Location Plan, Building C4, Level 49 – Vision Panels

KEY

- Type A
- Type B
- Type C
- Type D

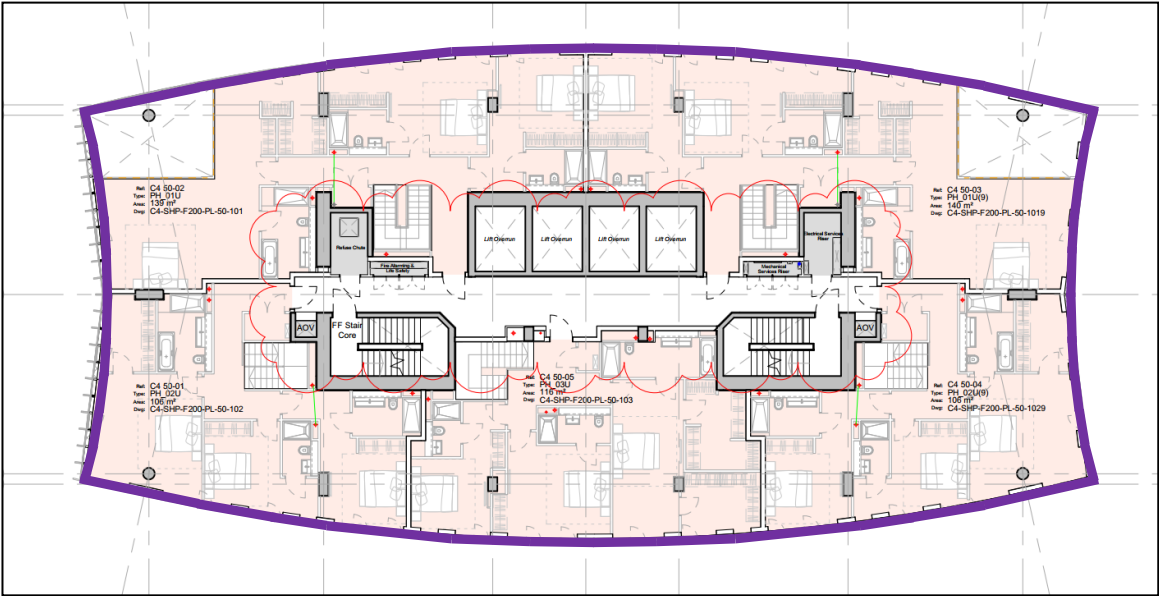


Figure 7: Acoustic Specification Location Plan, Building C4, Level 50 - Vision Panels

KEY

- Type A
- Type B
- Type C
- Type D

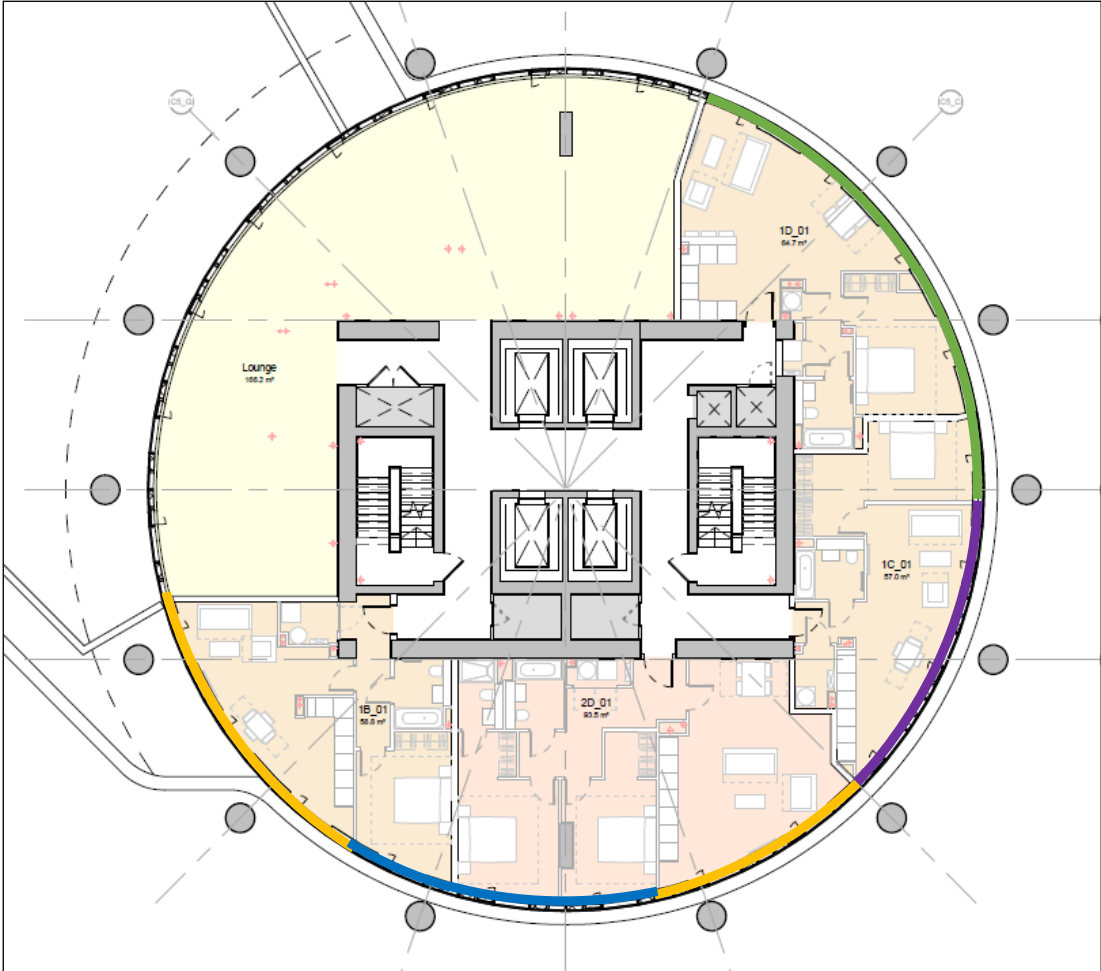


Figure 8: Acoustic Specification Location Plan, Building C5, Level 02 – Vision Panels

KEY

- Type A
- Type B
- Type C
- Type D

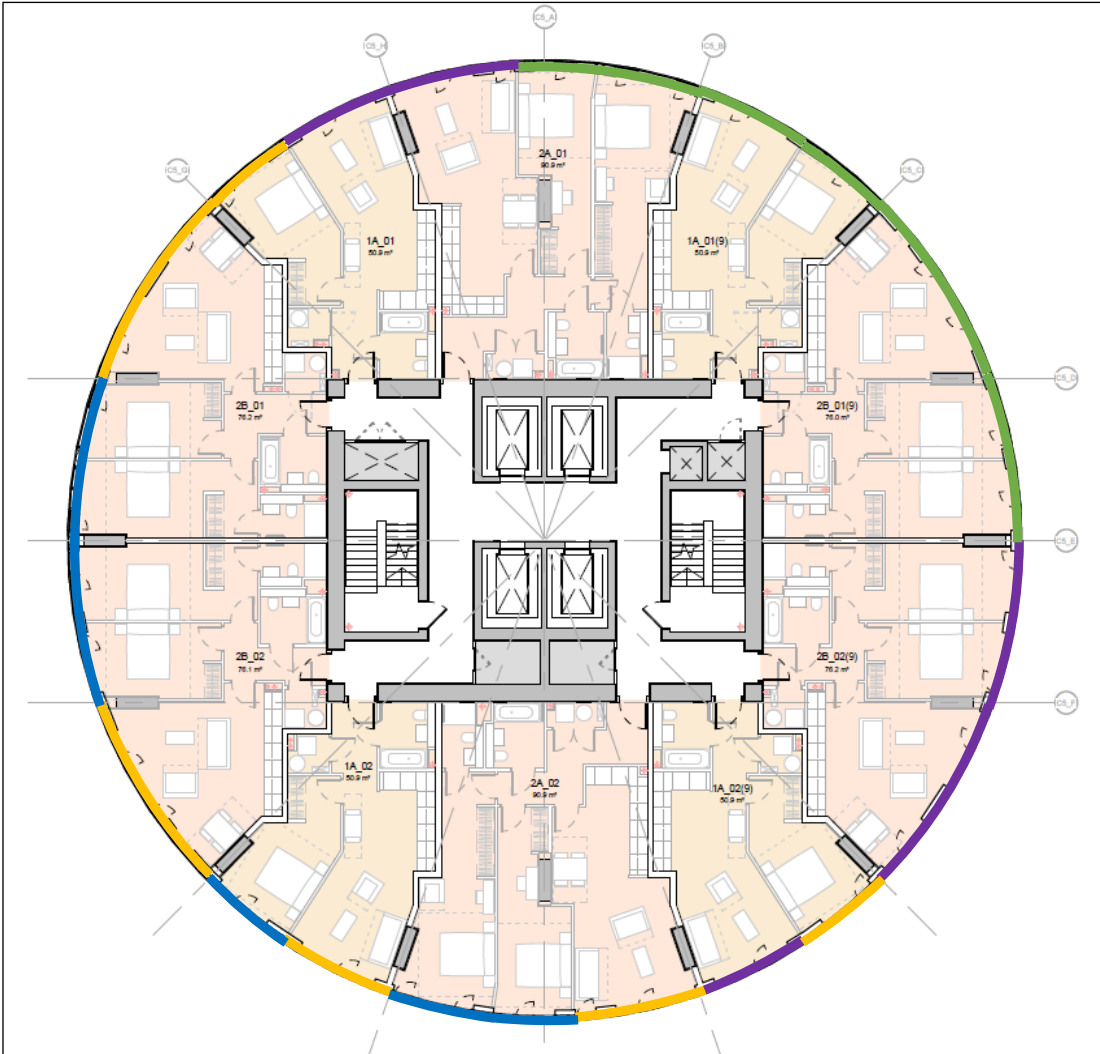


Figure 9: Acoustic Specification Location Plan, Building C5, Level 03 to 20 – Vision Panels

KEY

- Type A
- Type B
- Type C
- Type D

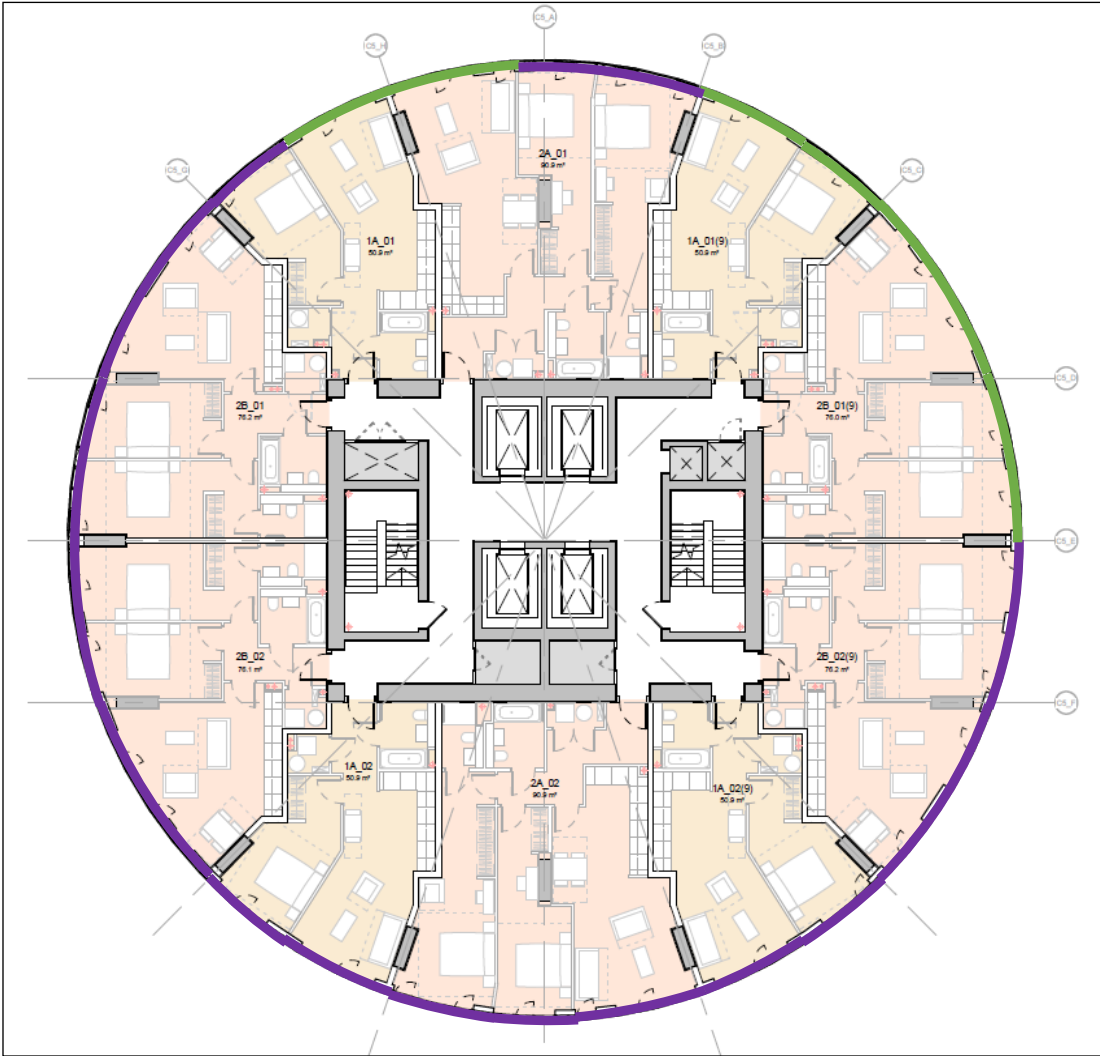


Figure 10: Acoustic Specification Location Plan, Building C5, Level 21 to 39 – Vision Panels

KEY

- Type A
- Type B
- Type C
- Type D

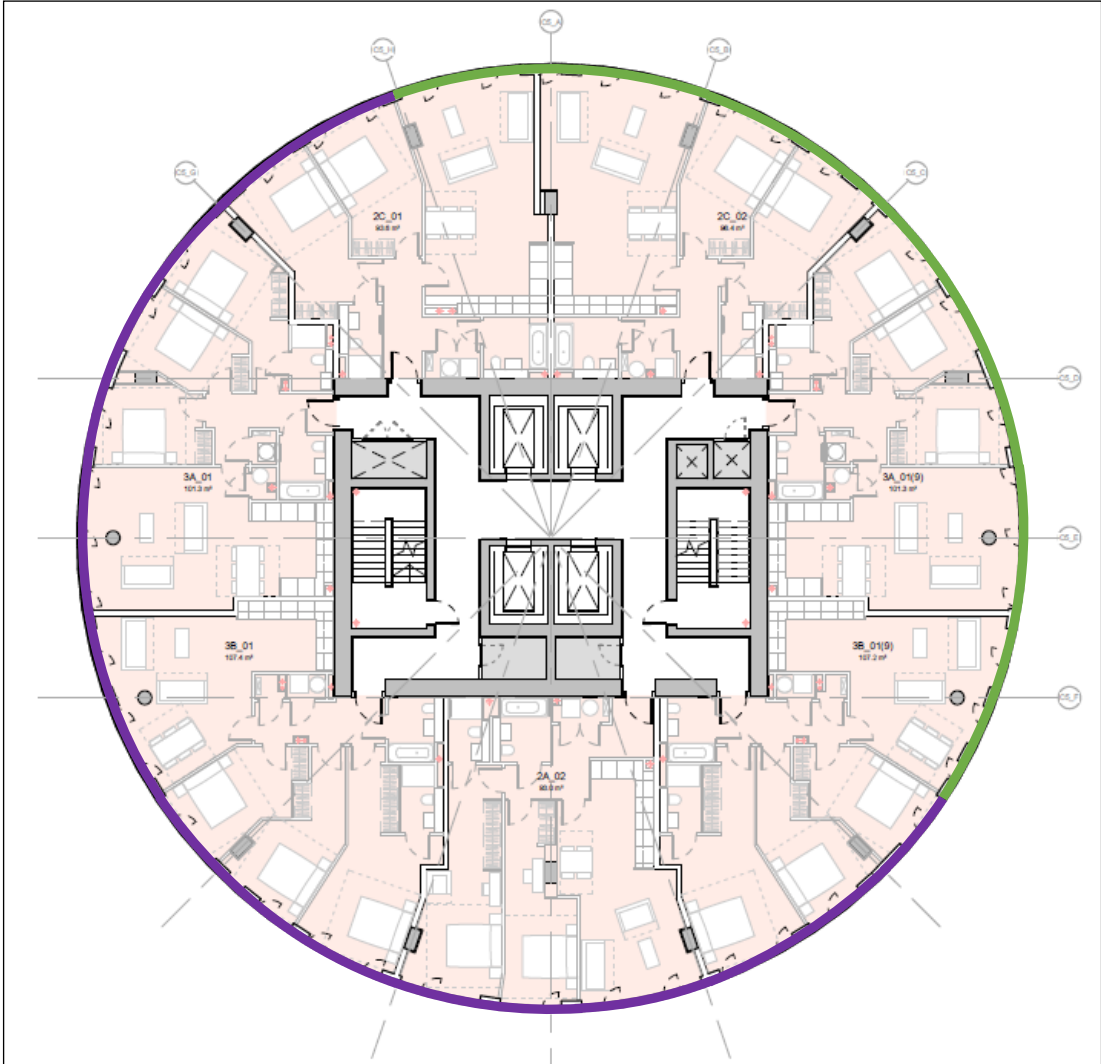


Figure 11: Acoustic Specification Location Plan, Building C5, Level 40 to 48 – Vision Panels

KEY

- Type A
- Type B
- Type C
- Type D

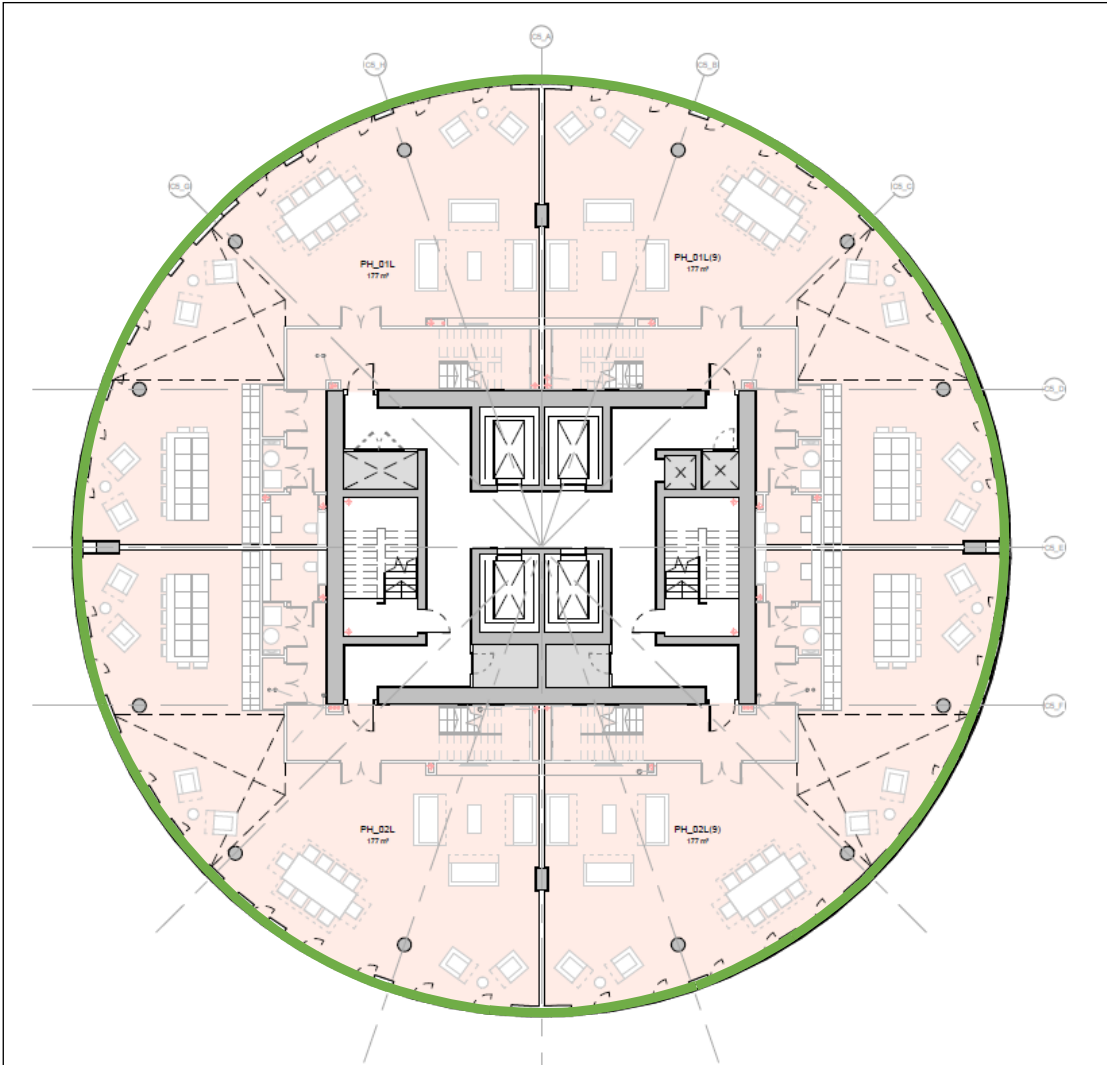


Figure 12: Acoustic Specification Location Plan, Building C5, Level 49 – Vision Panels

KEY

- Type A
- Type B
- Type C
- Type D

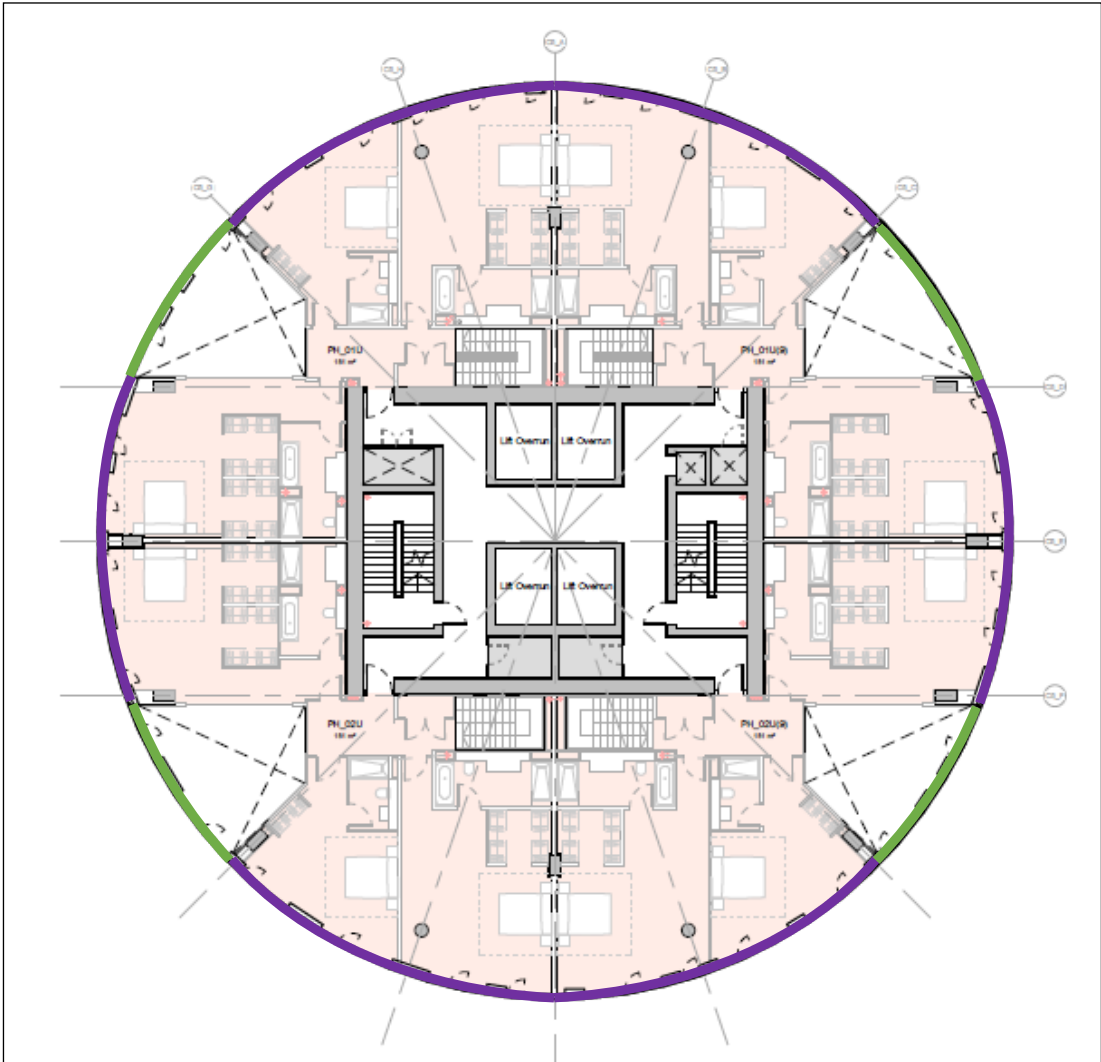


Figure 13: Acoustic Specification Location Plan, Building C5, Level 50 – Vision Panels

KEY

- Type A
- Type B
- Type C
- Type D

Purge panels

In order to provide rapid (purge) natural ventilation, the curtain wall includes inward-opening solid doors within apartment bedrooms and living rooms. It is understood that the door is to be an insulated aluminium panel. A fixed perforated panel will be positioned on the outer frame that incorporates the opening door.

It has been determined that a range of acoustic specifications for the purge panels to the proposed habitable rooms will be required to achieve the recommended internal noise levels. Figures 14 to 19 identify the locations of the various recommended specification types to Tower C4. Figures 20 to 25 identify the locations of the various recommended specification types to Tower C5. Table 4 identifies the minimum recommended Sound Reduction Index of the purge panel types when closed. The recommended performance values in Table 4 relate to the composite performance of the panel, the panel frame and the acoustic seals around the perimeter of the opening panel.

Purge Vent Type	Sound Reduction Index (dB) @ Octave Band Centre Frequency (Hz)						
	63 Hz	125 Hz	250 Hz	500 Hz	1kHz	2kHz	4kHz
Enhanced Plus purge vent	23	32	36	41	43	47	50
Enhanced purge vent	23	23	33	40	43	45	48
Standard purge vent	16	17	22	30	35	40	42

Table 4: Minimum sound reduction index of purge vents to habitable rooms

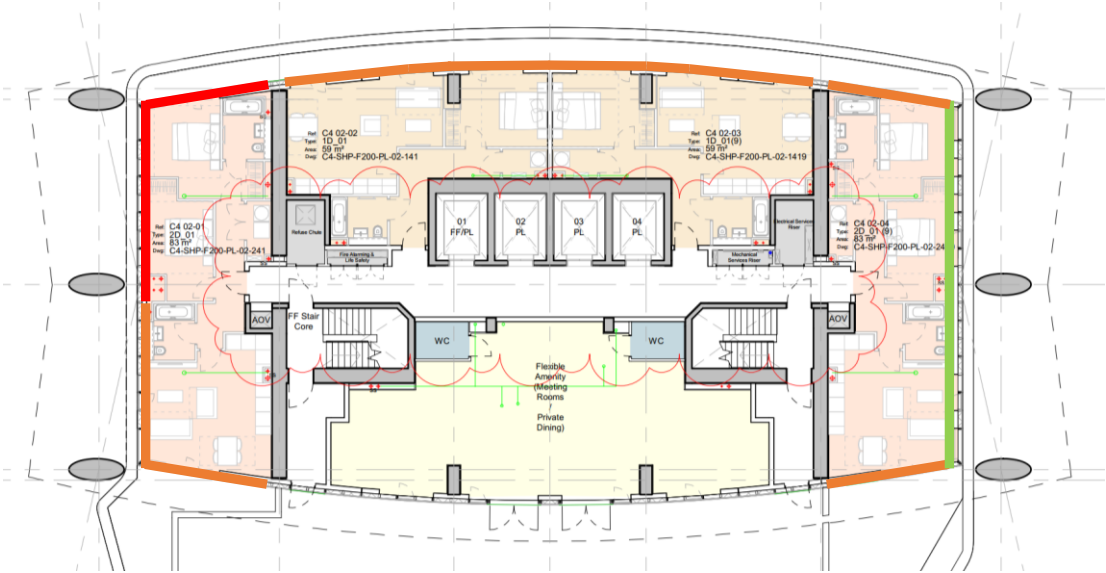


Figure 14: Acoustic Specification Location Plan, Building C4, Level 02 – Purge Panels

KEY

- Enhanced 'Plus'
- Enhanced
- Standard

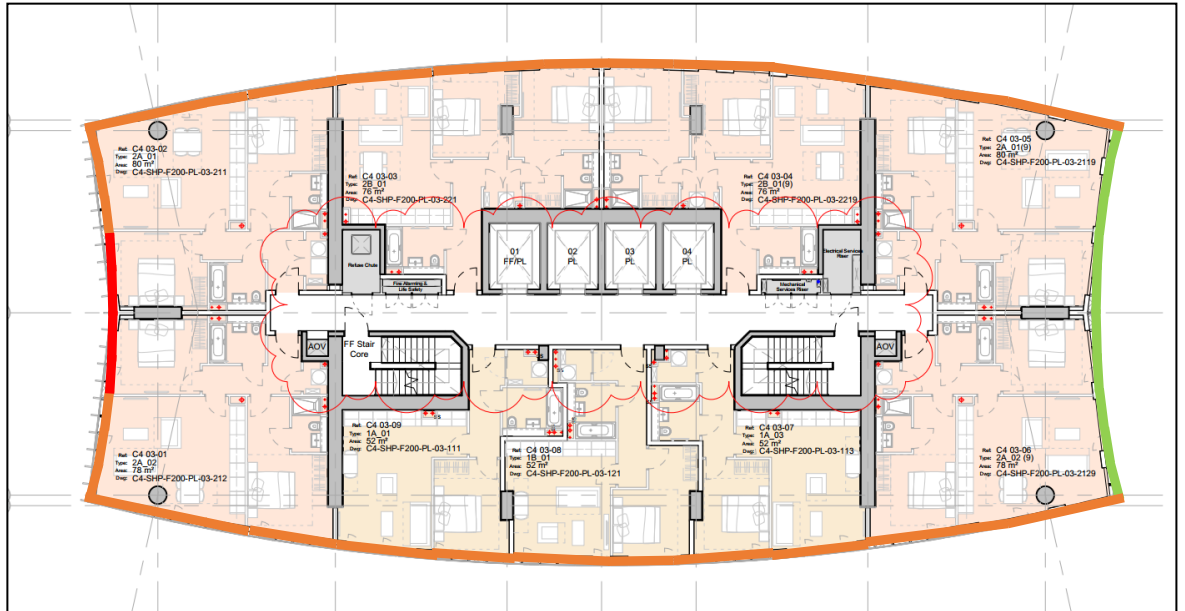


Figure 15: Acoustic Specification Location Plan, Building C4, Level 03 to 20 – Purge Panels

KEY

- Enhanced 'Plus'
 Enhanced
 Standard

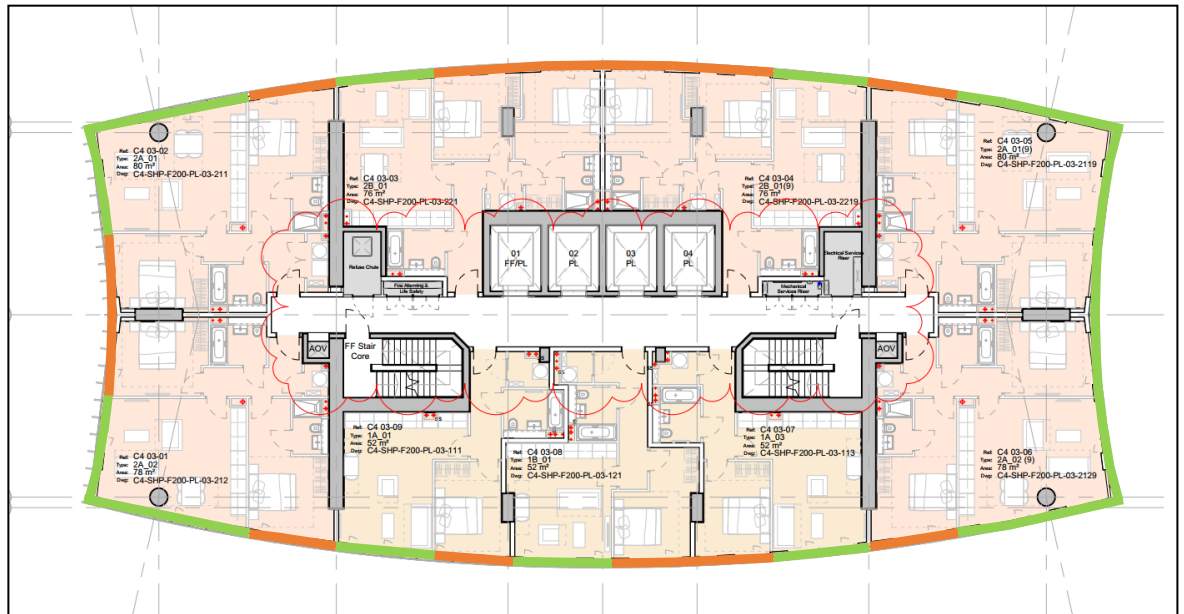
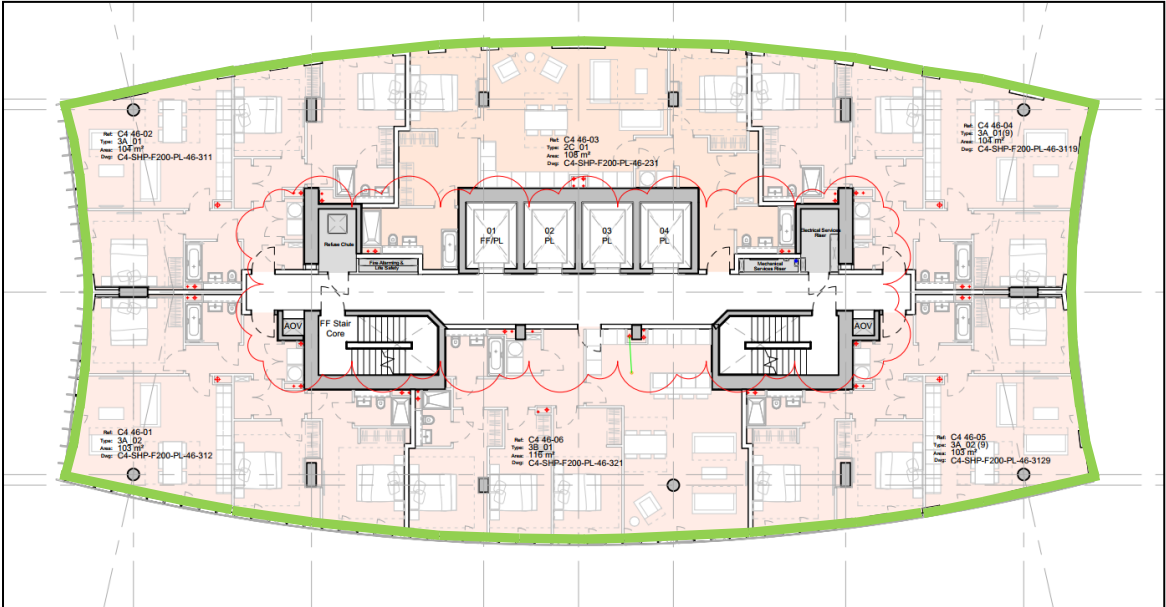


Figure 16: Acoustic Specification Location Plan, Building C4, Level 21 to 45 – Purge Panels

KEY

- | | |
|---|-----------------|
| | Enhanced 'Plus' |
|  | Enhanced |
|  | Standard |



KEY

- Enhanced 'Plus'
- Enhanced
- Standard

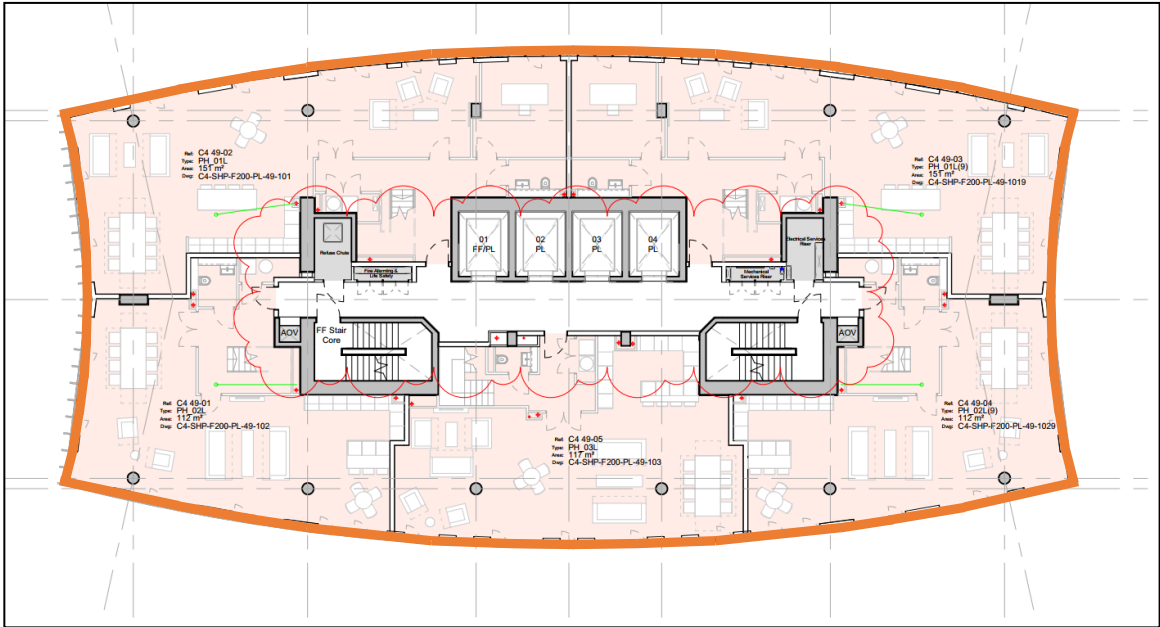


Figure 18: Acoustic Specification Location Plan, Building C4, Level 49 – Purge Panels

KEY

- Enhanced 'Plus'
- Enhanced
- Standard

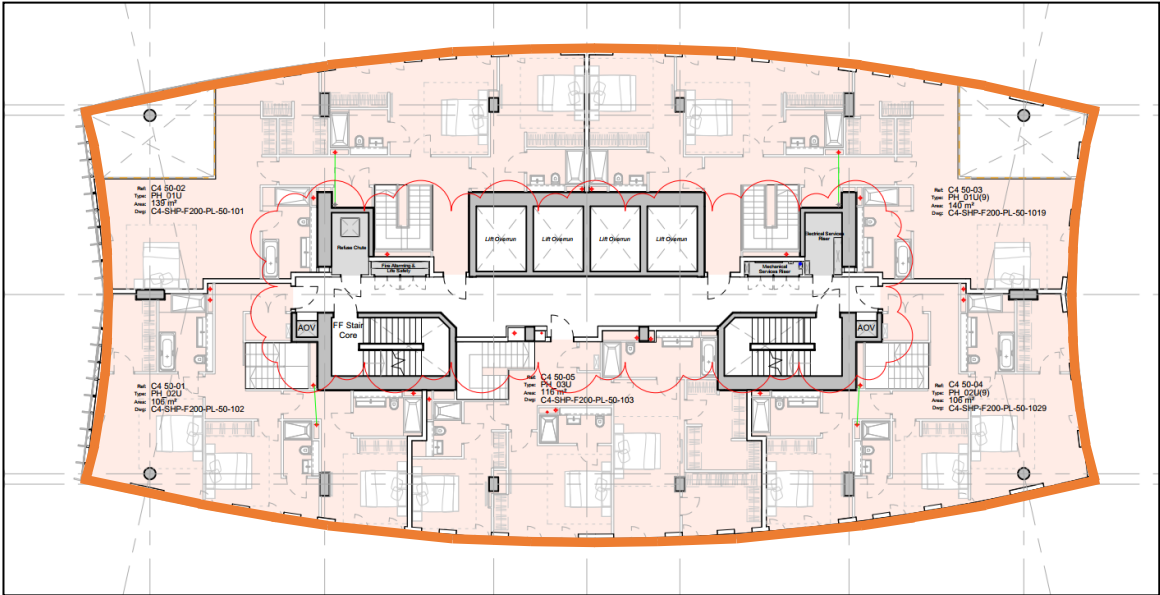


Figure 19: Acoustic Specification Location Plan, Building C4, Level 50 - Purge Panels

KEY

- Enhanced 'Plus'
- Enhanced
- Standard

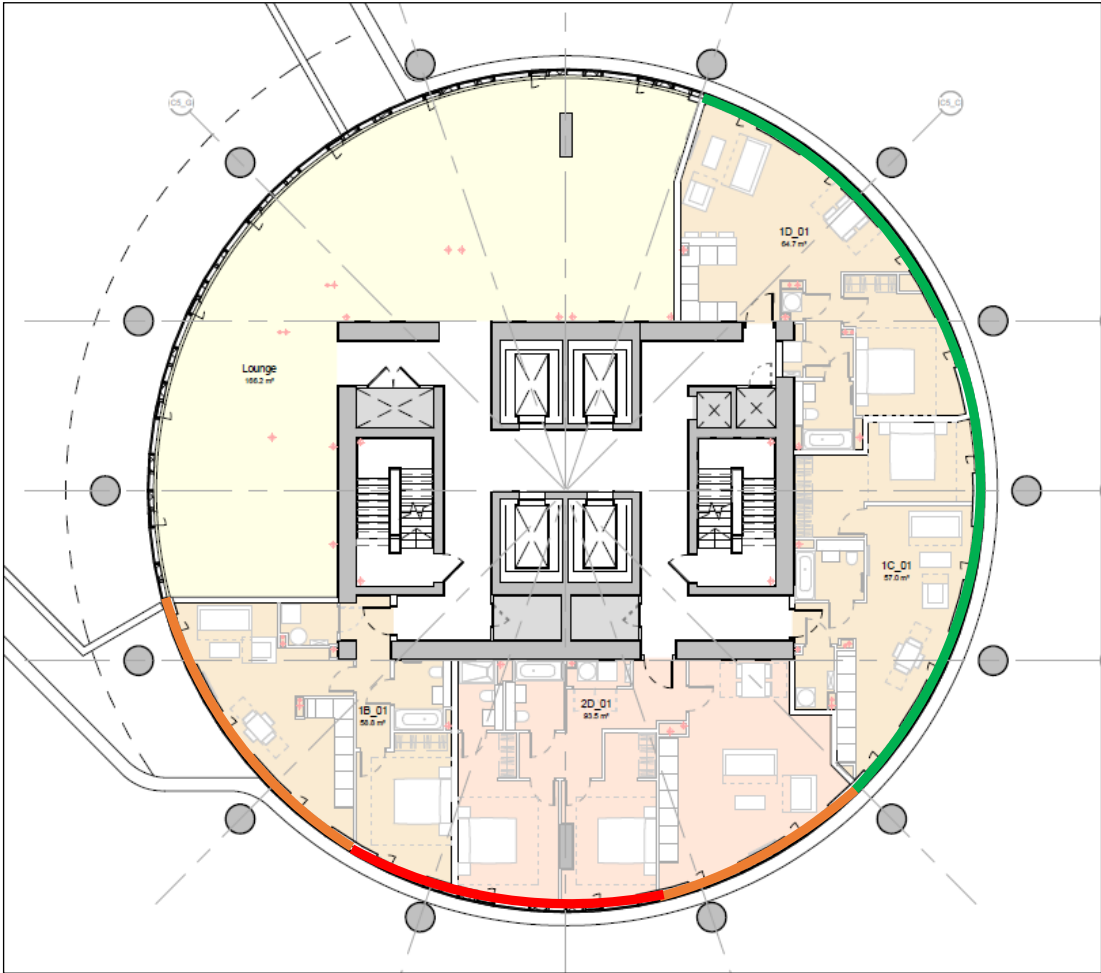


Figure 20: Acoustic Specification Location Plan, Building C5, Level 02 – Purge Panels

KEY

- Enhanced 'Plus'
- Enhanced
- Standard

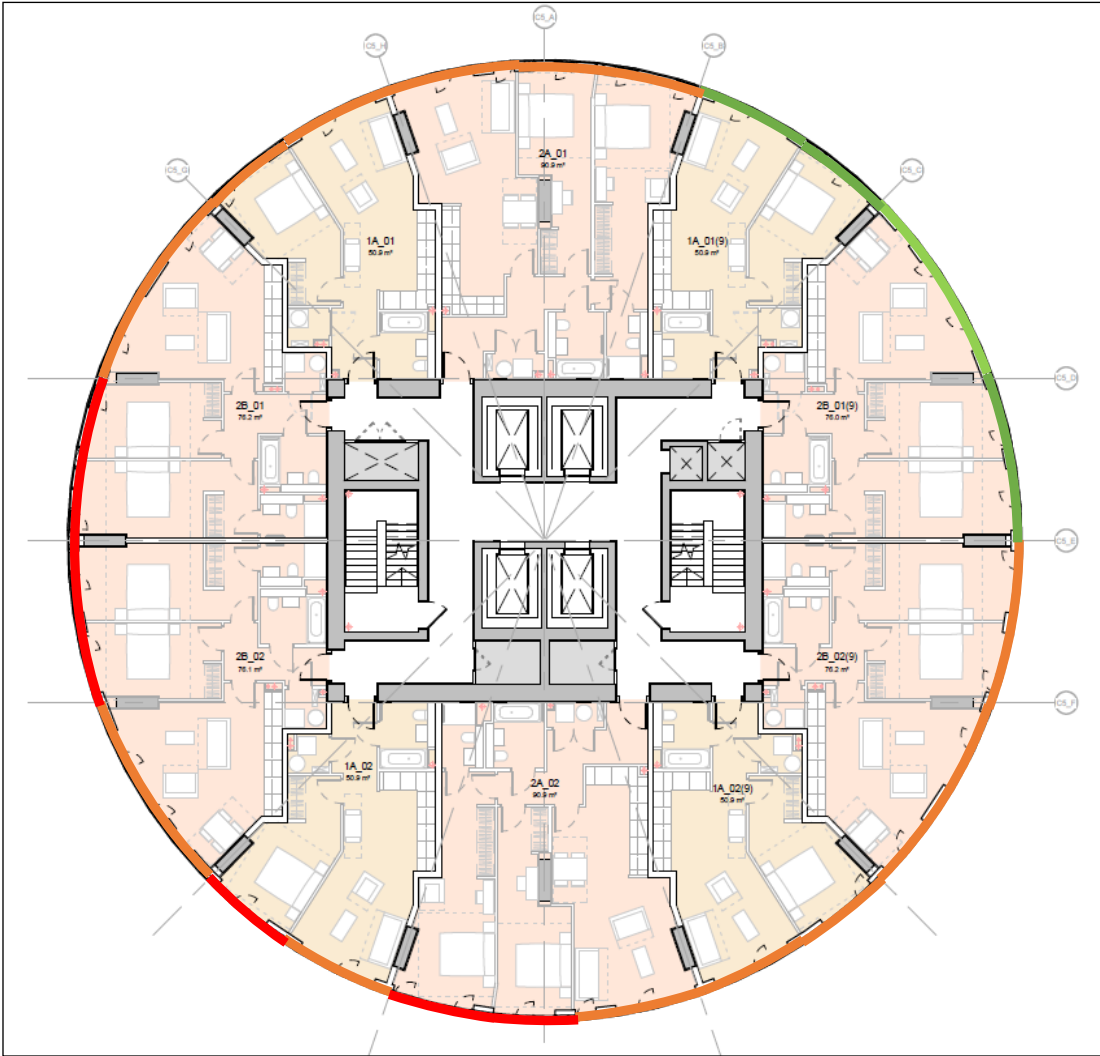


Figure 21: Acoustic Specification Location Plan, Building C5, Level 03 to 20 – Purge Panels

KEY

- Enhanced 'Plus'
- Enhanced
- Standard

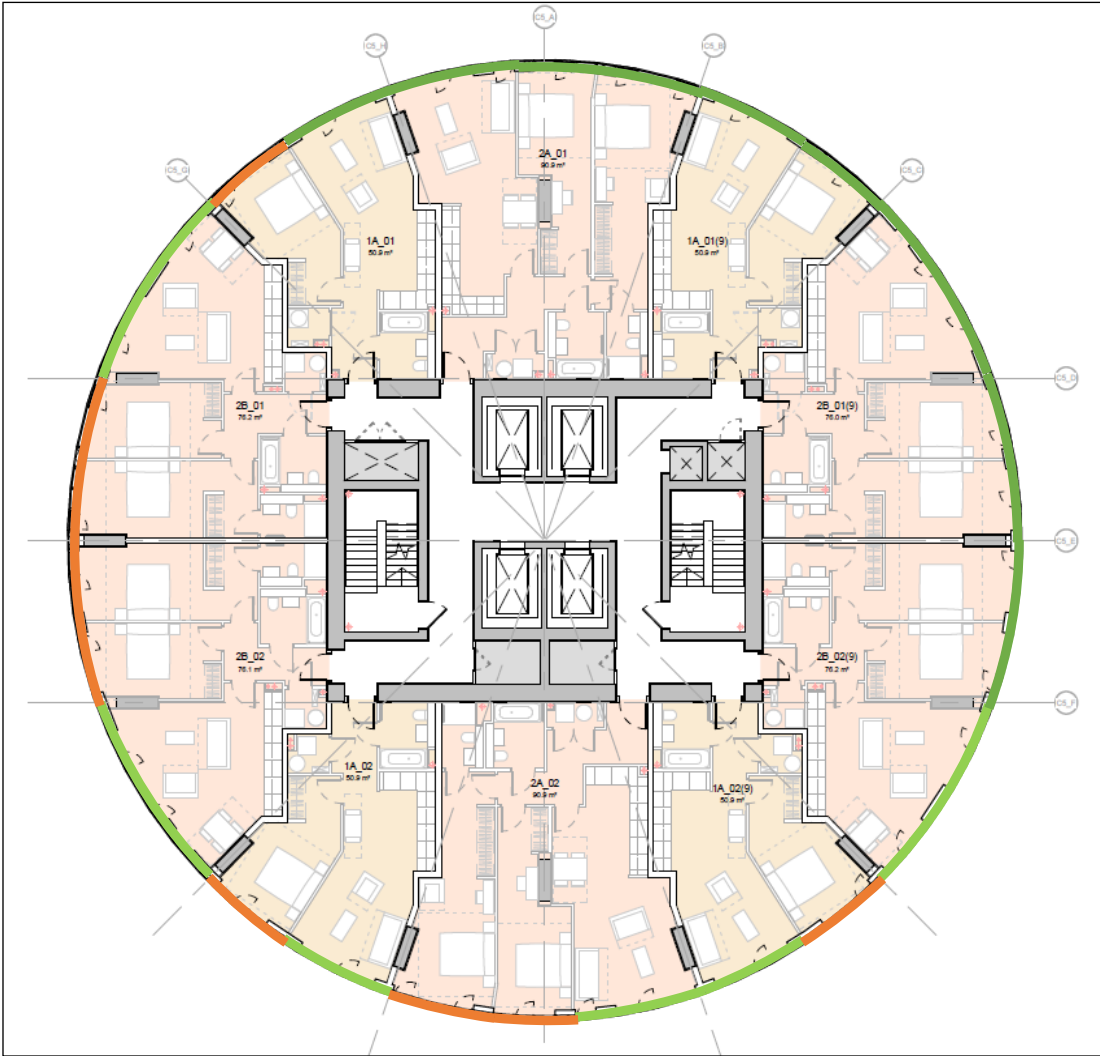


Figure 22: Acoustic Specification Location Plan, Building C5, Level 21 to 39 – Purge Panels

KEY

- Enhanced 'Plus'
- Enhanced
- Standard

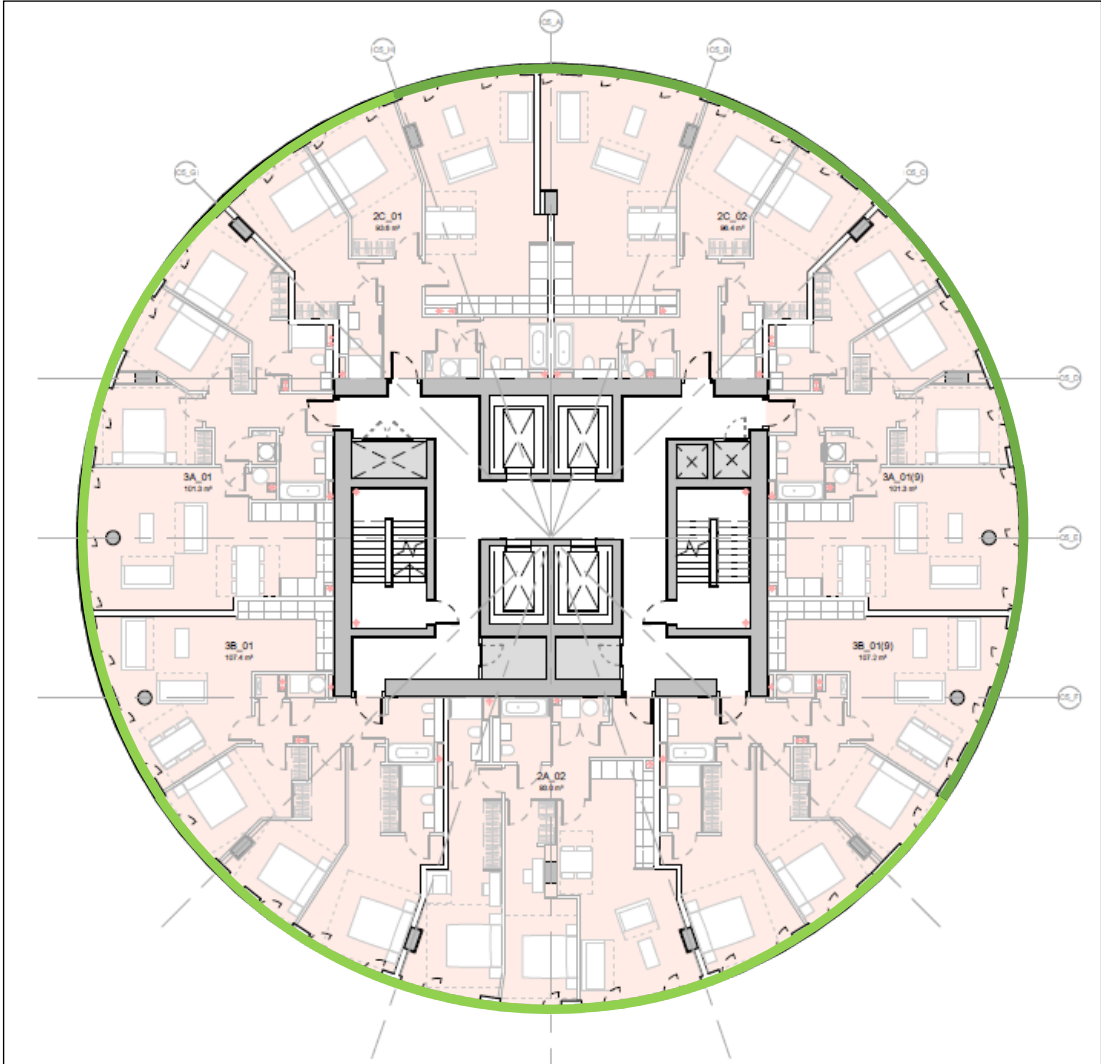


Figure 23: Acoustic Specification Location Plan, Building C5, Level 40 to 48 – Purge Panels

KEY

- Enhanced 'Plus'
- Enhanced
- Standard

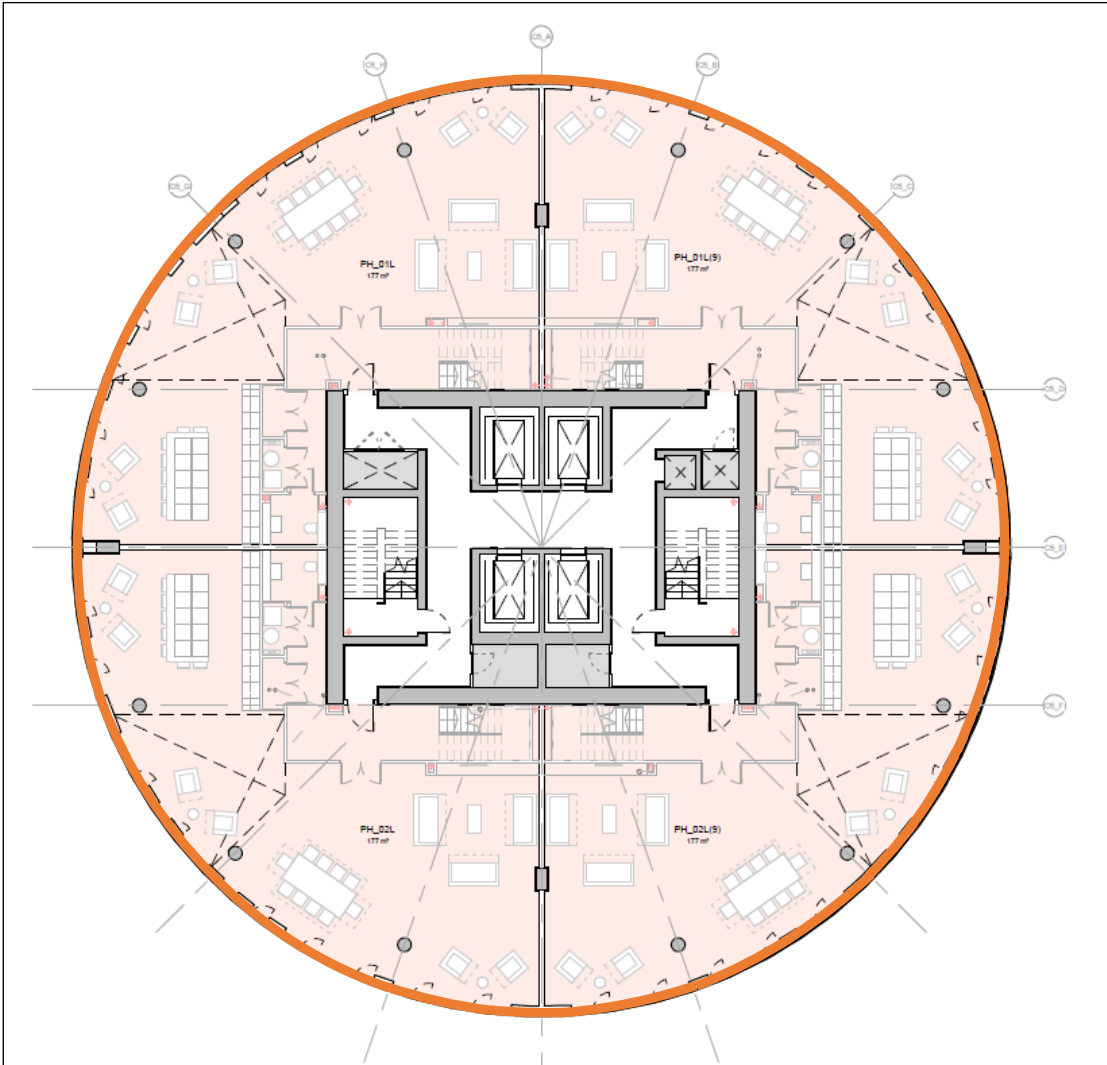


Figure 24: Acoustic Specification Location Plan, Building C5, Level 49 – Purge Panels

KEY

- Enhanced 'Plus'
- Enhanced
- Standard

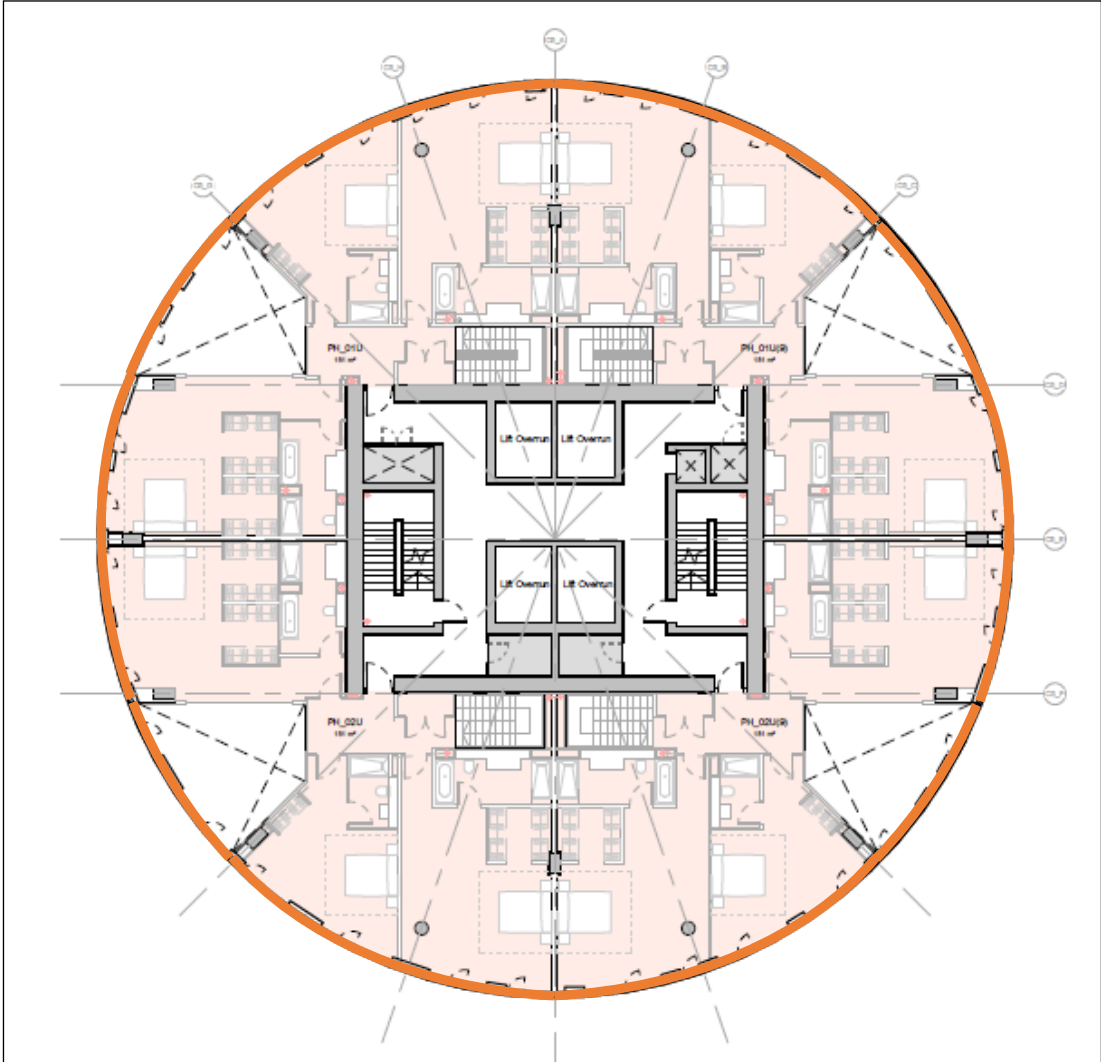


Figure 25: Acoustic Specification Location Plan, Building C5, Level 50 – Purge Panels

KEY

- Enhanced 'Plus'
- Enhanced
- Standard

Non-vision panels

Table 5 identifies the minimum recommended sound reduction index of the non-vision panels, including spandrel panels, to the proposed habitable rooms in Buildings C4 and C5. The drylining to the non-vision panels can be allowed to contribute to the achievement of the stated minimum values.

Room type	Sound Reduction Index (dB) @ Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Living Rooms & Bedrooms	24	36	45	50	55	60	55

Table 5: Minimum recommended sound reduction index of non-vision panels, Towers C4 and C5

To maximise the acoustic benefit of any drylining to the external wall, the drylining specification to the non-vision panels must continue up to the structural soffit. The full perimeter of the drylining to the external wall must be acoustically sealed with non-hardening acoustic sealant.

Given the recommended specifications of vision panels, non-vision panels and purge vent panels, compliance with the recommended daytime and night time 'average' (dB LAeq) noise criteria is expected in living rooms and bedrooms. Compliance with the requirement of planning conditions 19 and 57 in relation to the maximum noise levels in bedrooms during the night is also expected.