Curtain Road Properties Ltd

Supplementary Pre-Commencement Noise & Vibration Testing - 118 Curtain Road & 120-124 Curtain Road

Acoustic Report

11666526 v3 – March 2022

Move Forward with Confidence

BUREAU VERITAS

Document Control Sheet

Identification	
Client	Curtain Road Properties Ltd
Document Title	Supplementary Pre-Commencement Noise & Vibration Testing - 118 Curtain Road & 120-124 Curtain Road
Bureau Veritas Ref No.	11666526 v3

Contact Details	
Company Name	Bureau Veritas UK Limited
Contact Name	Craig Scott
Position	Business Unit Manager – Acoustics & Vibration
Address	5th Floor 66 Prescott Street London E1 8HG
Telephone	+44 (0)7974 026230
e-mail	craig.scott@bureauveritas.com
Websites	www.bureauveritas.co.uk

Configuration				
Version	**Date**	**Author**	**Reason for Issue/Summary of Changes**	**Status**
1	14/01/22	C Scott	Issued to client	Superseded
2	01/03/22	C Scott	Sections 1.7 and 5.9 amended. Appendix 5 added.	Superseded
3	11/03/22	C Scott	Sections 1.7, 5.9, 7.3 and 7.4 amended.	Live

	Name	Job Title	Signature
Prepared By	Craig Scott BEng (Hons) MIOA	Business Unit Manager – Acoustics & Vibration	
Reviewed By	Rocco Giudice BSc (Hons) MIOA, PgDip	Principal Consultant	

Contents

1 Executive Summary

1.1 Curtain Road Properties Ltd has appointed BV to undertake an assessment of potential noise and vibration associated with the construction works to be undertaken for a conversion of an existing warehouse at 118 Curtain Road, Shoreditch, into an office. The key aim of the assessment is to determine the impact of construction activities on music studios contained within 120-124 Curtain Road in context of Condition 15(a) of Hackney Borough Council Decision Notice (ref: 2018/03663) dated 24th May 2019.

The noise and vibration survey and assessment has been undertaken on the operational activities of construction equipment, in line with the Noise and Vibration Testing Statement (ref: 6479815/cs/L02, 22nd June 2021, included in Appendix 2) related to Condition 15(a)(ii) contained within Hackney Borough Council Decision Notice (ref: 2018/03663) dated 24th May 2019. The Decision Notice details the following as part of Condition 15 for the production of a Demolition and Construction Management Plan prior to the commencement of works connected to the planning consent:

"i. Details as to how the construction of the development can be carried out without exceeding the following noise and vibration levels at a location (or locations) to be agreed by the Local Planning Authority: 1. NR 15 Leq,15min; 2. 25 dB LAmax; 3. 0.5 mm/s PPV."

"ii. Details of on-site testing which demonstrates that the construction of the development can be carried out without exceeding the noise and vibration levels set out at part i above."

1.2 This report is with specific regard to limbs (i) and (ii) listed above and is supplementary to our report dated August 2021 in respect of levels of structure-borne noise and vibration transmission tested and monitored at 118 Curtain Road on 14th and 15th July.

1.3 A project design team exercise, led by Skidmore Owings and Merrill (SOM) Structural Engineers, explored the likely demolition and construction techniques and activities required to develop 118 Curtain Road. This exercise has been undertaken in collaboration with the noise and vibration consultants at Bureau Veritas.

1.4 The construction activities considered to induce highest levels of structure-borne noise and vibration transmission have been tested and monitored within Studios 1, 2 and 6 of 120-124 Curtain Road (monitoring equipment placed at locations agreed in advance with Vanguardia, acoustic consultants acting on behalf of the Strongroom Studio at 120-124 Curtain Road) and a summary of the outcome is contained in the table below. Monitoring was carried out on 20th and 21st of December 2021 (attended and witnessed by Vanguardia).

Tested Activity	Compliance with NR 15 $L_{eq,15mins}$ (noise) possible?	Compliance with 0.5 mm/s PPV (vibration) possible?	Alternative Techniques?
Column coring for strengthening	Yes	Yes	Not required
Saw cutting of concrete slab	Yes	Yes	Not required (see paragraph 1.7)
Stitch (core) drilling to concrete slab	Yes	Yes	Not required (see paragraph 1.7)
Percussive breaking of concrete	Likely to exceed	Yes	Required (see paragraph 1.6)
Breaking (munching) of roof slab	Likely to exceed	Yes	Required (see paragraph 1.6)

1.5 It may be observed there is the absence of assessment against 25 dB L_{Amax}, a further limit defined in Condition 15(a)(i). The measured noise levels provided an inconclusive data set, with the limit being exceeded by background conditions in all tests whether the construction test activity was present or not. Therefore, the only reasonable conclusion that can be reached is that the limits would be exceeded whether construction works are present or not. The assessment has therefore focussed on compliance with NR 15 $L_{eq,15mins}$, as this is a time-weighted average and therefore should provide a more conclusive, meaningful and accurate outcome. This is further discussed in paragraphs 6.5 and 6.6 of the report.

Alternative Techniques

1.6 The detailed assessment of measurements of construction activities have shown that it is heavy impact construction activities such as percussive breaking and breaking (munching) of the roof which will likely exceed the NR 15 $L_{eq,15min}$ limit as defined in Condition 15(a)(i). It is therefore necessary to consider alternative techniques that could be used to complete construction works that avoid the use of these specific techniques, whilst mitigating the impact as best as practicable. They are addressed in turn as follows:

- **Percussive Breaking**
    - Use of the percussive breaking methodology is a highly efficient construction technique for the rapid removal of concrete/masonry such as the upstands located at the rear of 118 Curtain Road existing loading bay. An alternative technique for the removal of these masonry upstands is to saw cut into small sections and remove from site for breaking elsewhere. This would require the use of the saw cutting construction technique; measured noise (and vibration) data has shown this technique can meet the NR 15 $L_{eq,15mins}$ (noise) and 0.5 mm/s PPV (vibration) limits, as defined in Condition 15(a)(i).
- **Breaking (munching) of Roof Slab**
    - Use of the Brokk to break (munch) the roof slab is a highly efficient construction technique for removal of the concrete roof section to the rear parts of 118 Curtain Road. An alternative technique for the removal of the roof is to saw cut into small sections and remove from site for breaking elsewhere. This would require the use of the saw cutting construction technique; measured noise (and vibration) data has shown this technique can meet the NR 15 $L_{eq,15mins}$ (noise) and 0.5 mm/s PPV (vibration) limits, as defined in Condition 15(a)(i).

1.7 With respect to saw cutting and stitch (core) drilling, whilst the detailed assessment has shown these activities are expected to meet the NR 15 $L_{eq,\ 15mins}$ and 0.5 mm/s PPV limits as defined in Condition 15(a)(i), this is dependent on the right techniques being adopted. Where tracks as the type seen in image A3.5, Appendix 3 (for the saw) or frames (for stitch) are required and are anchored to the slab or masonry construction. During tests conducted in Dec'21 the temporary anchor points (holes) were formed through the use of percussive drilling, which has an impact similar to that of percussive breaking then the NR 15 $L_{eq,\ 15mins}$ shall likely be exceeded (albeit for very short periods of time as the work to secure the tracks is an enabling activity). The specialist demolition contractor has advised that alternative techniques are available to form the temporary anchor points (holes) through the use of (handheld) core drilling, which do not require percussive drilling and therefore these should be adopted. Additional testing has been carried out to confirm that this technique generates noise levels that do not exceed those generated by Stitch core drilling; an activity that has been tested and shown that it can meet the limits contained in Condition 15(a)(i). This is discussed further in paragraphs 5.9, 7.3 and 7.4 of the report.

Cumulative Impacts

1.8 The outcome of the measurements and subsequent assessment of impacts has shown that there are construction and demolition techniques commonly adopted within the construction industry that are expected to meet the limits defined in Condition 15(a)(i). However, should some of these activities be undertaken simultaneously, there is a risk of exceeding limits within the most sensitive parts of 120-124 Curtain Road. Nonetheless, it should be noted that noise and vibration monitoring will be carried out in accordance with an agreed Demolition and Construction Management Plan in order to provide live monitoring and should limits be exceeded, activities can be ceased until a suitable alternative approach can be implemented.

2 Introduction

2.1 Curtain Road Properties Ltd has appointed BV to undertake an assessment of potential noise and vibration associated with the construction works to be undertaken for a conversion of an existing warehouse at 118 Curtain Road, Shoreditch, into an office. The key aim of this assessment is to determine the impact of construction activities on music studios contained within 120-124 Curtain Road in context of Condition 15(a) of Hackney Borough Council Decision Notice (ref: 2018/03663) dated 24th May 2019.

2.2 This report has taken into consideration the following aspects:

- On-site noise and vibration survey within 118 Curtain Road and 120-124 Curtain Road;
- Assessment of operational activities of the construction equipment required in order to complete the proposed conversion works;
- Analysis of the measured data from agreed studios within 120-124 Curtain Road against limits contained within Condition 15(a);
- Alternative techniques have been identified based on measured noise and vibration levels for activities where a breach of limits contained in Condition 15(a) is possible;
- Noise management plan during works that includes the description of the proposed noise and vibration monitoring is attached to this report.

2.3 This report sets out to address the recommendations for the control of the noise and vibration levels during the construction activities, to satisfy the conditions stated within Condition 15 of the HBC Decision Notice.

2.4 The construction site is bounded by Curtain Road on the west, by Dereham Street on the south, by a new-build office development on the east and by existing restaurant/bar and recording studio commercial activities on the north. As per site conditions, the nearest sensitive receptors are localised on the north side, where the Condition 15 of the HBC Decision Notice are mainly focused. Note, noise and vibration limits are also defined within the CMP that would apply to those neighbours not directly adjoining and are consistent with construction noise and vibration limits generally adopted for construction and demolition works.

120-124 Curtain Road

2.5 120-124 Curtain Road is occupied by Strongrooms which contains a number of music and recording studios and a bar and restaurant. Studios 1, 2 and 6 (formally Studio 11) are located on the party wall that separates 118 Curtain Road from 120-124 Curtain Road. Under license agreement dated 3rd December 2021 (see Appendix 3) access was granted to Studios 1, 2 and 6 from December 20th to 24th inclusive, from 8am to 2pm daily, in order to be able to complete noise and vibration monitoring on operational activities of construction equipment. Noise and vibration monitoring was witnessed throughout by Vanguardia, acoustic consultants representing Strongrooms.

2.6 The acoustic terminology used in this report is explained in Appendix One.

3 Assessment Criteria

3.1 The basis of this assessment are the noise and vibration limits defined in Condition 15(a) contained within Hackney Borough Council Decision Notice (ref: 2018/03663) dated 24th May 2019.

Condition 15(a)(ii) contained within Hackney Borough Council Decision Notice (ref: 2018/03663) dated 24th May 2019

3.2 The Statement related to planning application approval reference 2018/0363 at 118 Curtain Road, London EC2A 3PJ, within the London Borough of Hackney, seeks to address Condition 15(a) to the following:

"i. Details as to how the construction of the development can be carried out without exceeding the following noise and vibration levels at a location (or locations) to be agreed by the Local Planning Authority: 1. NR 15 Leq,15min; 2. 25 dB LAmax; 3. 0.5 mm/s PPV."

"ii. Details of on-site testing which demonstrates that the construction of the development can be carried out without exceeding the noise and vibration levels set out at part i above."

"iii. Details of noise and vibration monitoring to be carried out in accordance with the methodology set out in the Acoustic Report by Bureau Veritas dated November 2018. This monitoring data must be made available to the Local Authority when it is requested.

"iv. A liaison strategy between the applicant and adjacent businesses and property occupiers including a commitment to liaise with neighbours when particularly noisy periods of construction are likely to occur.

3.3 CRP instructed its professional team to identify and review the demolition and construction activities which will likely be required to develop 118 Curtain Road. The objective of this exercise was to inform which phases and activities of the development are likely to have the greatest potential noise and vibration impact, highlighting these for further review. The team sought to:

- Investigate the design in order to identify the key demolition and construction activities
- Define these activities with regard to location, duration, likely equipment/methodology
- Explore the potential noise and vibration impact of each activity
- Identify the activities for on-site testing and define their monitoring strategy

3.4 The project design team has explored the likely demolition and construction techniques and activities required to develop 118 Curtain Road. This exercise was led by Skidmore Owings and Merrill (SOM), Structural Engineers for the project, in collaboration with wider design team members, and noise and vibration experts, Bureau Veritas. Further input has also been sought and obtained from a number of contractors and specialists to help verify the assumptions made and provide additional comment and expertise. The critical construction activities are identified as below, along with the relative anticipated potential noise and vibration generated:

Construction Activity		Predicted Noise/Vibration Generated
		Very Low / Low / Medium / High / Very High
Roof Demolition		
Localised Floorslab and Wall Demolition		
Removal of Windows		
Soft Strip of Existing Removal of partitions, doors, finishes, redundant M&E equipment, fixtures and fittings etc.		
Column Strengthening:	> Core holes for any necessary steel bracing	
	> Insert any required steel columns/beams	
	> Any localised scabbling and concrete repair (mortaring/concrete grouting)	
New floors steel Frame Construction		
New Floorslab Construction		
Installation of Windows		
Internal Fit-out Installation of partitions, doors, M&E equipment, finishes etc.		

Fig 1.0

3.5 The matrix above suggests that it is the view of the project professional team that the activities with most potential for noise and vibration are those through the demolition and facilitating works phase, notably; the demolition of the roof slab, localised demolition of the floor slabs, and coring holes through existing columns for any necessary steel braces to be fitted for column strengthening. It should be noted however, that what this exercise did not attempt to forecast was the actual noise and vibration levels on receptors, the purpose of this exercise was to identify what practical tests would be necessary to undertake in order to obtain empirical data on the noise and vibration generated and the impact this may have on receptors. This report is the output from those practical tests.

4 Noise and Vibration Testing Methodology

4.1 In accordance with the construction techniques and activities required to develop 118 Curtain Road explored as part of a project design team exercise led by Skidmore Owings and Merrill (SOM) Structural Engineers, the following activities have been selected for the on-site tests as the most representative to induce highest levels of structure-borne noise and vibration transmission:

- Column coring for strengthening;
- Saw cutting of concrete slab;
- Stitch (core) drilling to concrete slab;
- Percussive breaking of concrete;
- Breaking (munching) roof slab.

4.2 Short term measurements (generally less than 60 seconds) were considered enough to determine if the stipulated limits in Condition 15(a)(i) are achievable within the music studios of Strongrooms. This was discussed with Vanguardia in advance of on-site testing and could be revised on-site if required. However, it was found this maximum measurement period was sufficient in order to obtain adequate data sets.

4.3 Table 4.1 below sets out the construction activities that were monitored within each of the Studios:

Table 4.1

Activity	Studio 1	Studio 2	Studio 6
Column coring for strengthening	--	✓	✓
Saw cutting of concrete slab	✓	--	✓
Stitch (core) drilling to concrete slab	✓	✓	✓
Percussive breaking of concrete	✓	✓	✓
Breaking (munching) of roof slab	✓	✓	✓

4.4 In order to provide a complete and consistent picture of noise and vibration monitoring, this was carried out within 118 Curtain Road and 120-124 Curtain Road simultaneously for each test. Within 118 Curtain Road, the noise and vibration monitors were placed at the source location (as close as was safely possible but typically at around 1m). Within studios, noise and vibration monitors were placed around 2m to 3m from edge of the studio along the party wall line, discussed with Vanguardia in order that locations were agreeable.

4.5 Furthermore, background noise and vibration measurements were undertaken within each of the studios in order to determine prevailing conditions in the absence of construction activities.

4.6 Monitoring equipment was set up to record in-line with Condition 15(a). In respect of vibration levels, Peak Particle Velocity (PPV) in mm/s was monitored. In respect of noise monitoring, overall A-weighted L_{eq} and L_{max} sound pressure levels along with linear octave band sound pressure levels were recorded. The noise survey was performed with the meters' time averaging constant set to 'Fast'.

4.7 The instrumentation used to measure noise and vibration during the survey is listed in Tables 4.2. All the instrumentation is controlled within the Bureau Veritas ISO 9001 accredited management system and has been verified to traceable standards within the last 2 years. A calibration check was performed on the sound level meters before and after use and no drift in calibration was noted.

Table 4.2: Attended survey instrumentation details

Item	Type	Serial number
RION Sound Level Meter	NL 52	01054193
RION Sound Level Meter	NK 52	01054194
Instantel Vibration Monitor	Minimate Plus	BE9533
Benstone Vibration Analyser	Impaq Elite	7000035

4.8 The construction equipment used during the tests are listed in Table 4.3.

Table 4.3: Attended construction equipment details

Item	Type	System pressure	Max Noise Level
Hydraulic breaker	Brokk 90	16.5 MPa	L_W 86 dB(A)
Diamond (Stitch) core drilling system	Hilti DD350	6 bar (max)	L_p 95 dB(A)
Percussive Breaker	Hilti TE-1000AVR	-	L_p 85 dB(A)
Diamond Blade Floor Saw	Tyrolit Hydrostress	-	L_W 96 dB(A)

4.9 Photos of test equipment are included in Appendix Three.

5 Measured Noise and Vibration Levels

5.1 Attended noise and vibration measurements were undertaken on 20th and 21st of December 2021. The outcomes have set out for each studio in turn, reflecting the relevant construction activity.

Studio 1

5.2 Tables 5.1 to 5.4 below summarise the measured noise levels within Studio 1 and 118 Curtain Road.

Table 5.1: Saw Cutting of Concrete Slab (test date 20/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	71	70	71	77	89	94	102	99	105
	L_{max} – Source	77	76	76	80	93	100	109	106	112
Studio 1	L_{eq} - Receive	44	30	24	17	18	13	13	14	24
	L_{eq} - Background	37	24	22	17	22	16	15	15	25
	L_{max} - Receive	49	36	34	23	26	17	18	18	30
	L_{max} - Background	40	42	38	32	40	27	24	18	40

Table 5.2: Stitch (core) Drilling of Concrete Slab (test date 20/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	56	68	75	78	82	88	92	92	97
	L_{max} – Source	64	75	84	83	86	92	97	97	101
Studio 1	L_{eq} - Receive	31	25	23	18	21	17	16	16	25
	L_{eq} - Background	37	24	22	17	22	16	15	15	25
	L_{max} - Receive	38	41	42	33	39	27	26	22	40
	L_{max} - Background	40	42	38	32	40	27	24	18	40

Table 5.3: Percussive Breaking of Concrete (test date 20/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	72	75	85	85	87	89	92	106	105
	L_{max} – Source	81	81	92	91	90	93	97	113	112
Studio 1	L_{eq} - Receive	35	36	39	35	29	20	15	15	36
	L_{eq} - Background	37	24	22	17	22	16	15	15	25
	L_{max} - Receive	40	41	43	39	33	25	27	23	40
	L_{max} - Background	40	42	38	32	40	27	24	18	40

Table 5.4: Breaking (munching) of Roof Slab (test date 21/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	79	76	79	85	86	86	84	80	92
	L_{max} – Source	92	89	90	100	103	101	98	93	106
Studio 1	L_{eq} - Receive	43	47	32	22	18	14	14	13	33
	L_{eq} - Background	25	25	23	18	16	20	17	14	25
	L_{max} - Receive	53	63	46	34	38	24	28	21	47
	L_{max} - Background	37	46	44	44	39	40	33	25	46

5.3 Table 5.5 below presents the outcome of vibration monitoring within Studio 1 and 118 Curtain Road.

Table 5.5: Vibration monitoring – Studio 1

Location	Measurement	Construction Activity (date)			
		Saw Cutting (20/12/21)	Stitch Drilling (20/12/21)	Percussive Breaking (20/12/21)	Breaking of Roof (21/12/21)
118	PPV - Source	0.4 mm/s	0.7 mm/s	1.5 mm/s	7.9 mm/s
Studio 1	PPV - Receive	0.04 mm/s	0.04 mm/s	0.04 mm/s	0.08 mm/s
	PPV - Background	0.03 mm/s	0.03 mm/s	0.03 mm/s	0.05 mm/s

Studio 2

5.4 Tables 5.6 to 5.9 below summarise the measured noise levels within Studio 2 and 118 Curtain Road. Note, noise (and vibration) measurements were undertaken within the small vocal/piano booth to the side of the main editing suite. Initially measurements were attempted to be undertaken within the main editing suite, however background noise was heavily influenced by HVAC and reflective measurement of construction activities was not achievable. Within the vocal/piano booth however, HVAC noise was not present.

Table 5.6: Column Coring (test date 20/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	65	71	78	78	81	82	83	81	89
	L_{max} – Source	75	76	84	82	84	85	85	84	90
Studio 2 (booth)	L_{eq} - Receive	32	29	26	17	18	17	14	15	25
	L_{eq} - Background	29	31	21	16	19	14	13	13	22
	L_{max} - Receive	42	36	33	42	46	37	32	29	47
	L_{max} - Background	37	41	39	30	38	25	24	17	38

Table 5.7: Stitch (core) Drilling of Concrete Slab (test date 20/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	64	69	67	73	79	86	86	84	91
	L_{max} – Source	78	80	77	78	83	89	91	89	95
Studio 2 (booth)	L_{eq} - Receive	36	34	23	16	18	16	14	13	24
	L_{eq} - Background	29	31	21	16	19	14	13	13	22
	L_{max} - Receive	47	43	33	27	35	31	28	17	36
	L_{max} - Background	37	41	39	30	38	25	24	17	38

Table 5.8: Percussive Breaking of Concrete (test date 20/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	72	75	85	85	87	89	92	106	105
	L_{max} – Source	81	81	92	91	90	93	97	113	112
Studio 2 (booth)	L_{eq} - Receive	40	39	44	29	30	23	19	16	36
	L_{eq} - Background	29	31	21	16	19	14	13	13	22
	L_{max} - Receive	46	44	49	34	39	26	23	18	42
	L_{max} - Background	40	42	38	32	40	27	24	18	40

Table 5.9: Breaking (munching) of Roof Slab (test date 21/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	79	76	79	85	86	86	84	80	92
	L_{max} – Source	92	89	90	100	103	101	98	93	106
Studio 2 (booth)	L_{eq} - Receive	33	29	24	20	18	16	17	16	25
	L_{eq} - Background	33	23	21	17	19	15	15	15	23
	L_{max} - Receive	40	44	40	36	37	25	33	31	39
	L_{max} - Background	38	38	38	30	36	23	18	18	36

5.5 Table 5.10 below presents the outcome of vibration monitoring within Studio 2 and 118 Curtain Road.

Table 5.10: Vibration monitoring – Studio 2 (booth)

Location	Measurement	Construction Activity (date)			
		Column Coring (20/12/21)	Stitch Drilling (20/12/21)	Percussive Breaking (20/12/21)	Breaking of Roof (21/12/21)
118	PPV - Source	0.4 mm/s	0.7 mm/s	1.5 mm/s	7.9 mm/s
Studio 2 (booth)	PPV - Receive	0.05 mm/s	0.05 mm/s	0.5 mm/s	0.07 mm/s
	PPV - Background	0.03 mm/s	0.03 mm/s	0.03 mm/s	0.05 mm/s

Studio 6

5.6 Tables 5.11 to 5.15 below summarise the measured noise levels within Studio 6 and 118 Curtain Road.

Table 5.11: Column Coring (test date 20/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	65	71	78	78	81	82	83	81	89
	L_{max} – Source	75	76	84	82	84	85	85	84	90
Studio 6	L_{eq} - Receive	33	30	27	18	19	18	15	16	26
	L_{eq} - Background	29	25	25	20	17	16	16	15	24
	L_{max} - Receive	40	35	31	40	44	35	30	27	45
	L_{max} - Background	37	40	38	35	30	28	28	26	35

Table 5.12: Saw Cutting of Concrete Slab (test date 20/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	71	70	71	77	89	94	102	99	105
	L_{max} – Source	77	76	76	80	93	100	109	106	112
Studio 6	L_{eq} - Receive	33	25	23	22	20	18	17	16	26
	L_{eq} - Background	29	25	25	20	17	16	16	15	24
	L_{max} - Receive	48	41	38	36	32	29	31	30	37
	L_{max} - Background	37	40	38	35	30	28	28	26	35

Table 5.13: Stitch (core) Drilling of Concrete Slab (test date 20/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	64	69	67	73	79	86	86	84	91
	L_{max} – Source	78	80	77	78	83	89	91	89	95
Studio 6	L_{eq} - Receive	30	30	25	19	21	18	18	16	26
	L_{eq} - Background	29	25	25	20	17	16	16	15	24
	L_{max} - Receive	37	39	41	35	41	28	33	29	42
	L_{max} - Background	37	40	38	35	30	28	28	26	35

Table 5.14: Percussive Breaking of Concrete (test date 20/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	72	75	85	85	87	89	92	106	105
	L_{max} – Source	81	81	92	91	90	93	97	113	112
Studio 6	L_{eq} - Receive	42	49	37	28	19	17	15	14	34
	L_{eq} - Background	29	25	25	20	17	16	16	15	24
	L_{max} - Receive	46	50	39	30	30	28	21	19	36
	L_{max} - Background	37	40	38	35	30	28	28	26	35

Table 5.15: Breaking (munching) of Roof Slab (test date 21/12/21)

Location	Measurement	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
118	L_{eq} - Source	79	76	79	85	86	86	84	80	92
	L_{max} – Source	92	89	90	100	103	101	98	93	106
Studio 6	L_{eq} - Receive	49	34	29	33	20	20	17	15	32
	L_{eq} - Background	38	25	27	22	14	14	13	14	24
	L_{max} - Receive	63	52	47	49	42	46	30	24	45
	L_{max} - Background	47	35	39	34	24	29	22	15	33

5.7 Table 5.16 below presents the outcome of vibration monitoring within Studio 6 and 118 Curtain Road.

Table 5.16: Vibration monitoring – Studio 6

Location	Measurement	Construction Activity (date)				
		Column Coring (20/12/21)	Saw Cutting (20/12/21)	Stitch Drilling (20/12/21)	Percussive Breaking (20/12/21)	Breaking of Roof (21/12/21)
118	PPV - Source	0.4 mm/s	0.4 mm/s	0.7 mm/s	1.5 mm/s	7.9 mm/s
Studio 6	PPV - Receive	0.04 mm/s	0.04 mm/s	0.05 mm/s	0.04 mm/s	0.2 mm/s
	PPV - Background	0.03 mm/s	0.03 mm/s	0.03 mm/s	0.03 mm/s	0.05 mm/s

Subjective Observations

5.8 In addition to the objective noise and vibration measurements and results presented in Tables 5.1 to 5.16, subjective observations were noted during the measurements. With respect to noise, these are summarised in Table 5.17 below in context of the following commonly used 'audibility' definitions:

- 'Not audible' – activity not audible above prevailing background conditions;
- 'Just audible' – activity just audible above prevailing background conditions;
- 'Audible' – activity audible above prevailing background conditions.

Table 5.17: Subjective Observations

Activity	Studio 1	Studio 2	Studio 6
Column coring for strengthening	*	Not/Just audible	Not/Just audible
Saw cutting of concrete slab	Not/Just audible	*	Not/just audible
Stitch (core) drilling to concrete slab	Just audible	Just audible	Just audible
Percussive breaking of concrete	Audible	Audible	Audible
Breaking (munching) of roof slab	Audible	Audible	Audible

*Column coring and saw cutting tests not undertaken for Studio 1 and Studio 2 respectively as the same tests had returned consistent outcome in other studios and therefore data set considered sufficient.

5.9 There is further clarification required in relation to the subjective observations of the saw cutting and stitch (core) drilling activities shown in Table 5.17. These are provided below:

- Saw cutting – in order to mount the track for the saw, the tests conducted in Dec'21 involved percussive drilling to the slab in order to provide temporary anchor points (holes) for mechanical fixing anchors (refer to highlighted part of page 4 of the contractors Method Statement included at Appendix 5 of this report). When percussive drilling was being undertaken, this was audible. Therefore, the subjective observations in Table 5.17 refer only to the saw cutting activity, and not the mounting of the track to the slab. In dialogue with the contractors undertaking the works they advised there are other means by which the anchor points (holes) for the track anchors can be formed that does not involve percussive drilling, through the use of (handheld) core drilling;

- Stitch (core) Drilling – very similar to the description for saw cutting. In order to mount the frame to undertake stitch (core) drilling, the tests conducted in Dec'21 involved percussive drilling to the slab in order to provide temporary anchor points (holes) for mechanical fixing anchors (refer to highlighted part of page 6 of the contractors Method Statement included at Appendix 5 of this report). When percussive drilling was being undertaken, this was audible. Therefore, the subjective observations in Table 5.17 refer only to the stitch (core) drilling activity, and not the mounting of the frame to the slab. In dialogue with the contractors undertaking the works they advised there are other means by which the frame can be mounted that does not involve percussive drilling, through the use of (handheld) core drilling.

5.10 With respect to vibration, this was not observed during the majority of measurements and only detected occasionally during percussive works and roof slab breaking. Observations are supported by measured data presented in Tables 5.5, 5.10 and 5.16.

6 Assessment

6.1 This section assesses the outcome of the noise and vibration measurements against the limits as defined in Condition 15(a)(i):

"i. Details as to how the construction of the development can be carried out without exceeding the following noise and vibration levels at a location (or locations) to be agreed by the Local Planning Authority: 1. NR 15 Leq,15min; 2. 25 dB LAmax; 3. 0.5 mm/s PPV."

NR 15 $L_{eq,15min}$

6.2 With respect to showing compliance with the NR 15 $L_{eq,15min}$ limit, it is important to consider noise levels measured of construction activities against the prevailing background noise level within the Studios. There are a number of construction activities where noise levels, as provided in Section 5 of this report, are similar to prevailing background noise levels and as such these will have some influence on the noise levels measured for given activities. It is therefore necessary to logarithmically correct for the influence of background noise levels accordingly.

6.3 Where measured noise levels of a given activity exceed those of the prevailing background, the prevailing background should be logarithmically subtracted from the activity noise. However, in some instances, where the prevailing background is the same as or exceeds the measured noise level of an activity, it would be reasonable to assume that the activity noise level is at least 10 dB below the background and therefore has no influence on the prevailing background. This approach will be adopted in assessing measured activity noise levels against the NR 15 $L_{eq,15min}$ criteria.

6.4 Note also, whilst the noise limit refers to a 15 minute time period, the short term noise measurements of activities (once correct for prevailing background where required) are expected to be representative of a 15 minute period, once time-weighted. Table 6.1 below sets out the NR 15 L_{eq} criteria to be satisfied.

Table 6.1: NR 15 L_{eq}

Octave Band Noise Levels (dB)							
63Hz	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
47	35	26	20	15	12	9	8

25 dB L_{Amax}

6.5 With respect to L_{Amax} criteria, the measured noise levels provided an inconclusive data set. As will be noted from the measured activity and prevailing background noise levels, none meet the criteria in its quoted form – and this includes background noise levels in the absence of construction activity. Unlike assessment against NR 15 L_{eq}, it is not considered appropriate to logarithmically subtract background L_{Amax} levels from those measured with construction activities present, as that would make the incorrect assumption that the background L_{Amax} is consistent contributor to the L_{Amax} noise levels with construction activities present. It was evident during monitoring within studios, measurements of L_{Amax} were being influenced by even the slightest of movement or breathing of individuals, resulting in the limit being exceeded.

6.6 Therefore, based on the measured data and observations during monitoring, the only reasonable conclusion that can be reached is that the limits would be exceeded whether construction works are present or not (particularly when an individual is present within a given studio). As such (and discussed on the day of testing with Vanguardia), focus has been placed on assessing against NR 15 $L_{eq,15min}$ criteria as this is a time-weighted average and therefore should provide a more conclusive, meaningful and accurate outcome.

0.5 mm/s PPV

6.7 Vibration monitoring equipment was set up to monitor directly against the limit and unlike noise, there was no influence on monitored vibration from background prevailing conditions.

6.8 Therefore, the assessment of measured noise and vibration levels will focus on compliance with NR 15 $L_{eq,15min}$ (noise) and 0.5 mm/s PPV (vibration).

RAG Scale for Assessment

6.9 In order to help better visually understand the outcome of the assessments, a RAG scale has been adopted as follows:

- GREEN: Construction activity noise and vibration levels have been found to meet NR 15 $L_{eq,15mins}$ and 0.5 mm/s PPV;
- AMBER: Construction activity noise and vibration levels have been found to marginally exceed NR 15 L_{eq} by up to 3 dB and 0.5 mm/s PPV by up to 0.05 mm/s. These are considered to be within reasonable margin for error accounting for equipment accuracy (for example, the NL-52 noise meter categorised used for noise monitoring has an accuracy of ± 1.5 dB) and calculation technique, but acknowledges an excess was recorded during the respective monitoring period;
- RED: Construction activity noise and vibration levels have been found to exceed NR 15 $L_{eq,15mins}$ by in excess of 3 dB and exceed 0.5 mm/s PPV by greater than 0.05 mm/s and would be therefore generally expected to exceed the limits.

Studio 1

6.10 Tables 6.2 to 6.5 assess measured construction activity noise levels against NR 15 L_{eq}.

Table 6.2: Saw Cutting of Concrete Slab

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	44	30	24	17	18	13	13	14
L_{eq} - Background	37	24	22	17	22	16	15	15
L_{eq} – Receive (corrected)	43	29	20	7	12	6	5	5
NR 15	47	35	26	20	15	12	9	8
Outcome	-4	-6	-6	-13	-3	-6	-4	-3

Table 6.3: Stitch (core) Drilling of Concrete Slab

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	31	25	23	18	21	17	16	17
L_{eq} - Background	37	24	22	17	22	16	15	15
L_{eq} – Receive (corrected)	25	18	16	11	12	10	9	9
NR 15	47	35	26	20	15	12	9	8
Outcome	-22	-17	-10	-9	-3	-2	0	1

Table 6.4: Percussive Breaking of Concrete

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	35	36	39	35	29	20	15	15
L_{eq} - Background	37	24	22	17	22	16	15	15
L_{eq} – Receive (corrected)	29	36	39	35	28	18	5	5
NR 15	47	35	26	20	15	12	9	8
Outcome	-19	1	13	15	13	6	-4	-3

Table 6.5: Breaking (munching) of Roof Slab

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	43	47	32	22	18	14	14	13
L_{eq} - Background	25	25	23	18	16	20	17	14
L_{eq} – Receive (corrected)	43	47	31	20	14	10	7	4
NR 15	47	35	26	20	15	12	9	8
Outcome	-4	12	5	0	-1	-2	-2	-4

6.11 Table 6.6 below compares measured vibration levels within Studio 1 against 0.5 mm/s PPV criteria.

Table 6.6: Vibration – Studio 1

	Construction Activity			
	Saw Cutting	Stitch Drilling	Percussive Breaking	Breaking of Roof
PPV - Receive	0.04 mm/s	0.04 mm/s	0.04 mm/s	0.08 mm/s

6.12 Tables 6.2 to 6.5 highlight that the construction activities that are expected to exceed NR 15 $L_{eq,15mins}$ within Studio 1 are percussive breaking and breaking (munching) of the roof slab. With respect to vibration, the 0.5 mm/s PPV limit is expected to be met for all activities.

Studio 2 (booth)

6.13 Tables 6.7 to 6.10 assess measured construction activity noise levels against NR 15 L_{eq}.

Table 6.7: Column Coring

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	32	29	26	17	18	17	14	15
L_{eq} - Background	29	31	21	16	19	14	13	13
L_{eq} – Receive (corrected)	29	21	24	10	9	14	7	11
NR 15	47	35	26	20	15	12	9	8
Outcome	-18	-14	-2	-10	-6	2	-2	3

Table 6.8: Stitch (core) Drilling of Concrete Slab

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	36	34	23	16	18	16	14	13
L_{eq} - Background	29	31	21	16	19	14	13	13
L_{eq} – Receive (corrected)	35	21	19	6	9	12	7	3
NR 15	47	35	26	20	15	12	9	8
Outcome	-12	-14	-7	-14	-6	0	-2	-5

Table 6.9: Percussive Breaking of Concrete

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	40	39	44	29	30	23	19	16
L_{eq} - Background	29	31	21	16	19	14	13	13
L_{eq} – Receive (corrected)	40	38	44	29	30	22	18	13
NR 15	47	35	26	20	15	12	9	8
Outcome	-7	3	18	9	15	10	9	5

Table 6.10: Breaking (munching) of Roof Slab

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	33	29	24	20	18	16	17	16
L_{eq} - Background	33	23	21	17	19	15	15	15
L_{eq} – Receive (corrected)	23	28	21	17	9	9	13	9
NR 15	47	35	26	20	15	12	9	8
Outcome	-24	-7	-5	-3	-6	-3	4	1

6.14 Table 6.11 below compares measured vibration levels within Studio 1 against 0.5 mm/s PPV criteria.

Table 6.11: Vibration – Studio 2 (booth)

	Construction Activity			
	Column Coring	Stitch Drilling	Percussive Breaking	Breaking of Roof
PPV - Receive	0.05 mm/s	0.05 mm/s	0.5 mm/s	0.07 mm/s

6.15 Tables 6.7 to 6.10 highlight that the construction activities that are expected to exceed NR 15 $L_{eq,15mins}$ within Studio 2 are percussive breaking and breaking (munching) of the roof slab. With respect to vibration, the 0.5 mm/s PPV limit is expected to be met for all activities.

Studio 6

6.16 Tables 6.12 to 6.16 assess measured construction activity noise levels against NR 15 L_{eq}.

Table 6.12: Column Coring

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	33	30	27	18	19	18	15	16
L_{eq} - Background	29	25	25	20	17	16	16	15
L_{eq} – Receive (corrected)	31	28	23	10	15	14	6	9
NR 15	47	35	26	20	15	12	9	8
Outcome	-16	-7	-3	-10	0	2	-3	1

Table 6.13: Saw Cutting of Concrete Slab

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	33	25	23	22	20	18	17	16
L_{eq} - Background	29	25	25	20	17	16	16	15
L_{eq} – Receive (corrected)	31	15	15	18	17	14	10	9
NR 15	47	35	26	20	15	12	9	8
Outcome	-16	-20	-11	-2	2	2	1	1

Table 6.14: Stitch (core) Drilling of Concrete Slab

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	30	30	25	19	21	18	18	16
L_{eq} - Background	29	25	25	20	17	16	16	15
L_{eq} – Receive (corrected)	23	28	15	10	17	14	10	9
NR 15	47	35	26	20	15	12	9	8
Outcome	-24	-7	-11	-10	2	2	1	1

Table 6.15: Percussive Breaking of Concrete

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	42	49	37	28	19	17	15	14
L_{eq} - Background	29	25	25	20	17	16	16	15
L_{eq} – Receive (corrected)	42	49	37	27	15	10	6	5
NR 15	47	35	26	20	15	12	9	8
Outcome	-5	14	11	7	0	-2	-2	-3

Table 6.16: Breaking (munching) of Roof Slab

	Octave Band Noise Levels (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
L_{eq} - Receive	49	34	29	33	20	20	17	15
L_{eq} - Background	38	25	27	22	14	14	13	14
L_{eq} – Receive (corrected)	49	33	25	33	19	19	15	8
NR 15	47	35	26	20	15	12	9	8
Outcome	2	-2	-1	13	4	7	6	0

6.17 Table 6.17 below compares measured vibration levels within Studio 1 against 0.5 mm/s PPV criteria.

Table 6.17: Vibration – Studio 6

	Construction Activity				
	Column Coring	Saw Cutting	Stitch Drilling	Percussive Breaking	Breaking of Roof
PPV - Receive	0.04 mm/s	0.04 mm/s	0.05 mm/s	0.04 mm/s	0.2 mm/s

6.18 Tables 6.12 to 6.16 highlight that the construction activities that are expected to exceed NR 15 $L_{eq,15mins}$ within Studio 6 are percussive breaking and breaking (munching) of the roof slab. With respect to vibration, the 0.5 mm/s PPV limit is expected to be met for all activities.

Summary of Outcomes

6.19 In reviewing the assessments detailed in Tables 6.2 to 6.17 there is a consistent theme, heavy impact activities such as percussive breaking and breaking (munching) of the roof slab have been shown to generate noise levels that would be expected to exceed NR 15 $L_{eq,15mins}$ and thus the limit defined in Condition 15(a)(i). Vibration has been shown to not be an issue in context of the limit defined in Condition 15(a)(i).

6.20 The objective assessments set out in Tables 6.2 to 6.17 broadly align to subjective observations discussed in paragraphs 5.8 to 5.10.

6.21 It is therefore necessary to consider alternative techniques that could be adopted to replace percussive breaking and breaking (munching) of the roof slab such that satisfying the limit is achievable.

7 Recommendations and Mitigation

Alternative Techniques

7.1 The detailed assessment of measurements of construction activities within Studios 1, 2 and 6 have shown that it is heavy impact construction activities such as percussive breaking and breaking (munching) of the roof which will likely exceed the NR 15 $L_{eq,15min}$ limit as defined in Condition 15(a)(i). It is therefore necessary to consider alternative techniques that could be used to complete construction works that avoid the use of these specific techniques, whilst mitigating the impact as best as practicable. They are addressed in turn as follows:

- **Percussive Breaking**
    - Use of percussive breaking is a highly efficient construction technique for the rapid removal of concrete/masonry upstands located to the rear of the existing loading bay of 118 Curtain Road. It would therefore be expected that Studio 2 will be subject to the greatest impact from this activity, and that is reflected in measured noise levels (although percussive breaking was measurable in Studios 1 and 6 also).
    - An alternative technique for the removal of these masonry upstands is to saw cut into small sections and remove from site for breaking elsewhere. This would require the use of the saw cutting construction technique; measured noise (and vibration) data has shown this technique can meet the NR 15 $L_{eq,15mins}$ (noise) and 0.5 mm/s PPV (vibration) limits, as defined in Condition 15(a)(i).
- **Breaking (munching) of Roof Slab**
    - Use of the Brokk to break (munch) the roof slab is a highly efficient construction technique for removal of the roof section to the rear parts of 118 Curtain Road. It is therefore expected that Studio 6 would be subject to the greatest impact as it is closest in proximity and that is reflected in measured noise levels. Roof slab breaking was also measurable in Studio 1 and Studio 2, but the greater separating distances from the location of the breaking resulted in lower measured levels, notably Studio 2.
    - An alternative technique for the removal of the roof is to saw cut into small sections and remove from site for breaking elsewhere. This would require the use of the saw cutting construction technique; measured noise (and vibration) data has shown this technique can meet the NR 15 $L_{eq,15mins}$ (noise) and 0.5 mm/s PPV (vibration) limits, as defined in Condition 15(a)(i).
- **'Drill and Burst'**
    - 'Drill and Burst' is a technique that also been considered as alternative technique breaking masonry in-situ. This technique involves drilling a number of small holes, around 25 mm in diameter, and forcing water at a high pressure through the masonry until it breaks. It can then be removed from site. It is an effective low noise and vibration technique.
    - In order for 'Drill and Burst' to be utilised however, it requires concrete/masonry constructions that are at least 300 mm thick. Upon further investigation of the concrete/masonry constructions where this technique could be considered – the masonry upstands and roof slab, neither were found to be in excess of 200 mm thick and therefore 'Drill and Burst' would not be a valid technique.

Saw Cutting and Stitch (core) Drilling

7.2 Whilst the detailed assessment has shown these activities are expected to meet the NR 15 $L_{eq, 15mins}$ and 0.5 mm/s PPV limits as defined in Condition 15(a)(i), this is dependent on the right techniques being adopted. As discussed in paragraph 5.9, it is essential that where tracks (for the saw) or frames (for stitch) are required, these are not anchored to the slab or masonry construction in anchor points (holes) that are formed through the use of percussive drilling, which has an impact similar to that of percussive breaking.

7.3 It is therefore necessary to establish an alternative technique for forming the temporary anchor points (holes) and this is discussed in Paragraph 5.9. In order to verify that the use of a handheld core drill is an acceptable alternative means to form the anchor points (holes) for anchoring the track (saw cutting) and frame (stitch core drilling) additional noise tests were undertaken on 10 March'22. These consisted of noise measurements in close proximity to the handheld core drill (1m) and then comparison of measured noise levels with those previously measured close to stitch core drilling (see picture A4.10 of Appendix Four). Measurements were carried out at ground and first floor level. Table 7.1 below summarises the results;

Table 7.1: Stitch (core) Drilling of Concrete Slab (test date 20/12/21)

Tool	Measurement @ 1m	Octave Band Noise Levels (dB)								
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A
Handheld Core Drill	L_{eq} - Ground	55	62	63	69	79	84	77	71	87
	L_{eq} – First	56	58	61	69	79	83	76	71	86
Stitch Core Drill	L_{eq} - Ground	56	68	75	78	82	88	92	92	97
	L_{eq} - First	64	69	67	73	79	86	86	84	91

7.4 Table 7.1 confirms that handheld core drilling, used to form the temporary anchor points (holes) to anchor the track or frame, generates noise levels (at source) that do not exceed those measured for stitch core drilling. Given that it has been established stitch core drilling can meet the NR 15 L_{eq} limit as defined in Condition 15 (a)(i), then it is reasonable to consider and conclude handheld core drilling can also satisfy this limit.

Construction Noise and Vibration Monitoring

7.5 The control of the noise and vibration levels can be achieved by monitoring the construction activity on site, especially for those activities producing high noise levels and PPV (mm/s) for vibration. In order to have a control of the vibration and noise levels during the construction activities, the monitoring stations would be installed at appropriate locations for unattended survey.

7.6 Procedure regarding the calibration will follow the techniques traceable to national standards. The monitoring service should include weekly visits to the stations for downloading, swapping out of batteries and general maintenance. The monitoring stations will be capable of being accessed remotely to view live noise levels and download electronically. Alerts in forms of email and text message should be sent to the consultant managing the equipment and to relevant site personnel, such as the site manager, when the levels of noise and/or vibration exceed the triggers set to the monitors, and construction works should then cease until a suitable method can be identified to continue the task until an alternative methodology can be identified to continue the task and minimise disruption on adjacent businesses and property occupiers. The equipment would be installed and monitored by a fully qualified acoustic consultant using appropriate grade sound level meter(s) and seismic monitoring (vibration) systems at strategic measurement locations.

Cumulative Impacts

7.7 The assessment has focussed on the individual impacts of each activity in context of Condition 15(a)(i), however it is important to consider the cumulative impact of two or more activities, should they coincide.

7.8 The outcome of the measurements and subsequent assessment of construction activities has shown that there are construction and demolition techniques commonly adopted within the construction industry that meet the limits defined in Condition 15(a)(i). However, should some of these activities be undertaken simultaneously, there is a risk of exceeding limits within the most sensitive parts of 120-124 Curtain Road. Nonetheless, it should be noted that noise and vibration monitoring will be carried out in accordance with an agreed Demolition and Construction Management Plan in order to provide live monitoring and should limits be exceeded, activities can be ceased until a suitable alternative approach can be implemented.

Appendix One – Glossary of Acoustic Terminology

Decibel (dB) Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise i.e. whether is it high pitched, low pitched or with no distinct tonal character. These measurements are usually undertaken in octave or 1/3 octave frequency bands. If these values are logarithmically summed a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.

dBA Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or 1/3 octave band values, before logarithmically summing them. As a result the single dB(A) value provides a good representation of how loud a sound is.

NR The Noise Rating (NR) curves are a series of internationally agreed spectra of equal perceived loudness. They are the recognised method of expressing noise from continuous building services plant in buildings.

L_{max} The Lmax is the highest short-term noise level sample that occurred during a measurement period. When the 'fast' time weighting is used (i.e. L_{Fmax}), the sample time is 125 milliseconds.

RT The Reverberation Time (RT) is the length of time in seconds it would take for a sound to decay by 60 dB and is it therefore a measure of the 'echo' within a room. The reverberation time is often referred to as the T_{60} however it is often impractical to measure such a 60 dB noise level decay and so the reverberation time is often based on the T_{20} and T_{30} which related to the decay over 20 dB and 30 dB normalised to a decay of 60 dB. Measurements of the reverberation time are usually undertaken in accordance with BS EN 354.

D The sound insulation performance of a construction is a function of the difference in noise level either side of the construction in the presence of a loud noise source to one side. D, is therefore simply the level difference between the two rooms of interest.

D_{nT} The standardised level difference. D is corrected to allow for the reverberation time in the receiving room. Measurements are made in accordance with BS EN ISO 140-4.

$D_{nT,w}$ The weighted standardised level difference. A single value of the DnT derived from the third octave values using the method described in BS EN ISO 717-1.

R R is the *sound reduction index* of a material or construction measured under laboratory conditions in accordance with BS EN ISO 140-3. R takes account of the area of the construction under test as well as the absorption in the receiving room. Taking these into account allows the R for different constructions to be compared on a like for like basis.

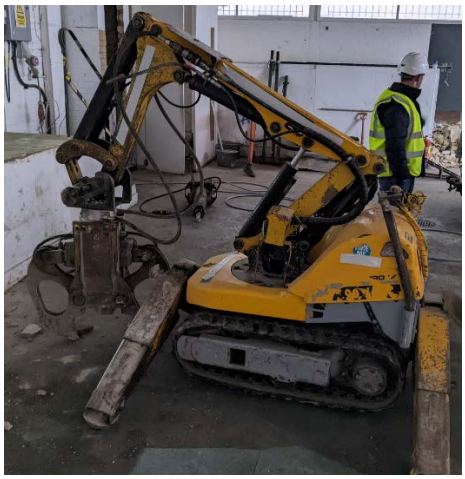
R_w R_w is the weighted sound reduction index determined using the above measurement procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.

Appendix Two – Noise and Vibration Testing Statement (ref: 6479815/cs/L02, 22nd June 2021

Appendix Three – License Agreement

Appendix Four – Photos of Construction Equipment

A4.1: Brokk 90 – Hydraulic Breaker



A4.2: Column Coring

A4.3: Stitch (core) Drill and Floor Saw

A4.4: Hilti Percussive Breaker

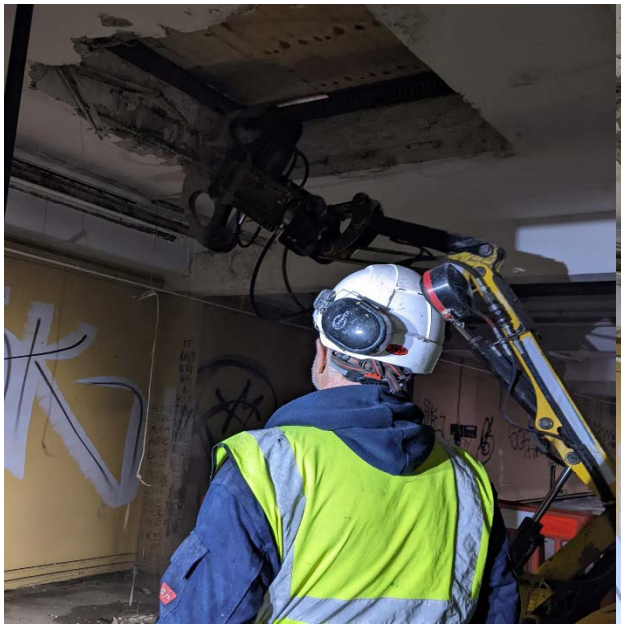
A4.5: Floor Saw Track

A4.6: Floor Cutting (Ground Floor)

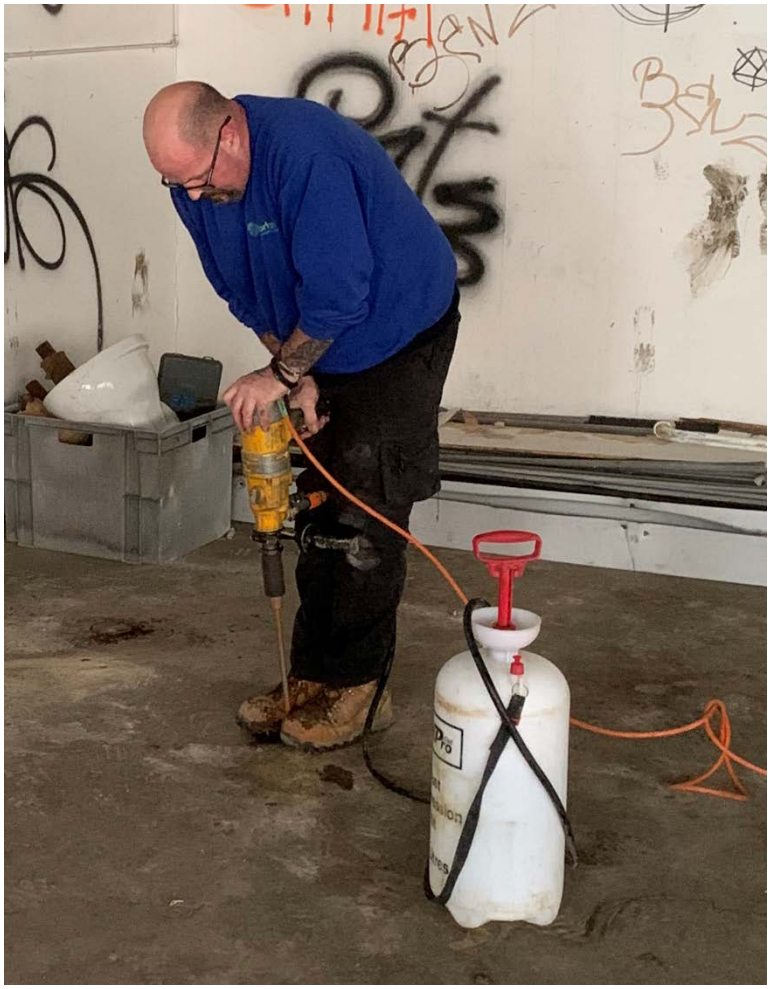
A4.7: Stitch (core) Drilling – Ground Floor

A4.8: Stitch (core) Drilling – First Floor

A4.9: Brokk 90 – Slab breaking, First Floor Roof



A4.10: Handheld Core Drill – creating temporary bolt holes



Appendix Five – Salter Demolition Task Method Statement for 118 Curtain Road Noise Assessment Trials (Dec'21)

3 - Sequence and Method of Work:

Track Sawing

- Prior to any works commencing on site, Salter Demolition shall ensure that all live services in the works area have been removed and made safe.

- Prior to works commencing and If required Salter Demolition shall install suitable 110v task lighting to enable the works.

- Salter Demolition shall also consult the asbestos surveys to ensure that Track Sawing work takes place in areas not affect by any identified ACM's.

- Salter Demolition/Client shall inform the concrete cutting operatives of the area they want noise readings carried out on.
These should be clearly defined and if necessary have been marked out in waterproof marker or paint having made sure the areas are safe from any or all "Live Services"

- The concrete cutting team will then set up their small light weight 415v diamond track mounted saw cutting system, this is done by securing the track rail to the structure at two points both with a mechanical M12 fixing anchor the track saw head is then clamped to the track. The diamond tipped saw blade is then bolted to the saw head with a safety guard system fitted around the blade, power and water are then connected to the machine, and thus the assembly is completed.

- Chapter 8 barriers fitted with acoustic barriers will then be positioned around the immediate track saw location to form exclusion zones.

- On completion of the sawing assembly the operative can then proceed to cut into the slab by way of sinking the blade into the structure to the desired depth. It is proposed a cut to a depth of approximately 50mm is performed as the head is then moved along the length of the track. Once it has reached the end of the track the blade is then sunken a further 50mm and the head moved back along the track, this is repeated forward & backwards continually sinking the blade until a noise reading has been achieved.

- Once the task is done the area of works are cleaned up by using the wet vac as with all good housekeeping. They shall then move their plant to the next location reset up and complete another noise reading.

Core Drilling

Prior to any works commencing on site, Salter Demolition shall ensure that all live services in the works area have been removed and made safe.

- Prior to works commencing and if required Salter Demolition shall install suitable 110v task lighting to enable the core drilling works trial area.

- Salter Demolition shall also consult the asbestos surveys to ensure that Core Drilling takes place in areas not affect by any identified ACM's.

- Salter Demolition shall inform the Core Drilling operatives of the floor slab, walls or columns they want noise readings carried out on. These should be clearly defined by having been marked out in waterproof marker or paint having made sure the areas are safe from any or all "Live Services". Ferro Scanning of all columns/walls/slabs to be cored will take place initially to ensure re-bar contained is identified in order that the core can be positioned to miss the re-bar.

- The Core Drilling operatives will then set up their small light weight 110v diamond drill rig, where required by the noise consultant, to the structure. This is done by anchoring the rig by means of an M12 mechanical fixing, to this the drill motor is clamped complete with core bit, power and water are the connected thus the drilling assembly is complete. (Handheld Core Drill Rig may also be used if short duration works only.)

- On completion of the drilling assembly the operative can then proceed to cut through the structure in increments of 25mm at a time slowly cutting through until the required noise reading has been achieved.

- Once the task is done the area of works are cleaned up by using the wet vac as with all good housekeeping.

- They shall then move their equipment to the next location and repeat the same process.