

17 March 2020

SCL.P.20200.200317.TM3

Survey Methodology

re: 121 Princess Street, Manchester

This document outlines an agreed testing methodology for the apartments at floor levels 1-6 at 121 Princess Street, Manchester.

Abbreviations:

SCL	Sound Consulting Limited
Peak	Peak Acoustics Ltd
MG	Miller Goodall Ltd
5 th Leisure	5 th Leisure Ltd
MCC	Manchester City Council
Centurion	Centurion Investments (JS VII) Ltd
Dwell	Dwell Student Living (Centurion Student Services (UK) Ltd)
Beech	Beech Design & Build Limited

1.0 INTRODUCTION

Internal ambient sound level measurements are required to inform an investigation of the performance of acoustic mitigation installed to protect residents from sound arising from Fifth nightclub, which operates in the basement of the building.

In order for the tests to be meaningful, attempts have been made to control as many variables as possible, although it should be noted that a number of these variables still remain uncontrolled. This agreed methodology reflects compromises that have been required on all sides to progress matters.

2.0 PURPOSE OF THE TESTING

The purpose of the testing is to inform an investigation of the sound reduction performance of the installed mitigation measures.

3.0 PRE-TEST REQUIREMENTS

5th Leisure has agreed, prior to the testing taking place, to identify, clarify and provide evidence for any and all changes made to the layout of the nightclub since 6th April 2017 (when the mitigation scheme was approved by MCC), to provide full details of any additional mitigation installed, and to confirm the layout of the nightclub at August 2015, at the time PDA undertook the sound measurements that the scheme was designed upon.

4.0 TESTING METHODOLOGY – SOURCE NOISE

4.1 SOURCE NOISE LOCATION

This testing exercise requires results which describe a clear and true account of the existing situation. The main source noise to be investigated therefore will be that arising from Fifth nightclub which operates in the basement of the building.

MCC and 5th Leisure have also requested that a source noise is considered in the ground floor of the building.

Without prejudice to the Appellant's views on the appropriateness of ground floor testing, the Appellant has nevertheless agreed to testing a ground floor sound source in line with MCC's requirement that it be considered "a typical city centre bar" which is its approved use.

The nightclub main club area and bunker sound systems, and a mock-up ground floor sound system, will be tested separately for the majority of tests to provide the most meaningful data for identifying any areas of concern should any of the tests return unfavourable results. The results can be simply added together to ascertain the overall noise levels due to various combinations of the sound systems operating simultaneously, but this method also enables the possibility of isolating the sources and identifying any particular problems associated with each. A number of additional tests are also proposed to be undertaken with all three sound systems operating simultaneously to augment and validate the results.

4.2 SOURCE NOISE CHARACTERISTICS

It is proposed that music loops be compiled for each of the three test areas to be repeated on a 10-second loop throughout the testing period. It is important that a representative style of music is used for each sound system and it has been agreed that using loops with varying beats per minute (BPM) would aid subjective assessment of the routes of the music noise within the building. 5th Leisure and MG have agreed to select representative music loops and circulate these promptly for review prior to the test date.

4.3 SOURCE NOISE LEVEL

Ideally the tests would be undertaken under controlled conditions, including controlling the source noise level with the use of noise limiting devices. 5th Leisure has not agreed to this method and as such, instead of using a calibrated noise source, it has been agreed to make the required corrections in the data analysis following the tests.

Approximately 2-3-minute sweep measurements will be undertaken in each source noise space to obtain spatial averages of each. SCL will also set up automatically logging sound meters in the centre of each dance floor to measure sound levels throughout the tests, with accompanying audio and video recording, to ensure that sound system settings are not tampered with whilst the consultants are undertaking the tests within the apartments.

The L_{eq} (equivalent continuous sound level) will be recorded in spectral one-third octave band data alongside the broadband A-weighted level.

NIGHTCLUB (BASEMENT)

The purpose of the tests is to inform an investigation of the sound reduction performance of installed mitigation measures. For the tests to be meaningful, the nightclub music level should be controlled so as not to exceed the source noise level upon which the approved and installed scheme of mitigation was based. The scheme of mitigation was approved by MCC on 20/04/2017 as follows:

Application number: CDN/17/0080

Part 2 – Particulars of decision

Manchester City Council gives notice that the detail(s) referred to in Part 1 are **Approved** in accordance with the information set out below.

Condition 3 (Acoustics)

On the basis of the following the pre-commencement part of the condition is discharged:

Implementation of recommendations in Peak Acoustics , Noise Impact Assessment Report No. TH1412162NR Rev. 2.0 dated 06/04/2017, 121 Princess Street

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

The sound levels upon which Peak Acoustics' scheme of mitigation (as detailed in Report No. TH1412162NR Rev. 2.0 dated 06/04/2017) was based, are those measured by PDA Ltd in August 2015, which are reproduced below.

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k	dB (A)
Design Spectrum	115	109	101	96	90	84	83	87	98

Table 4.1 (a) – PDA Ltd octave band nightclub music sound data from 12/08/2015

[dB ref. 20µPa]

50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	3k	5k	6.3k	8k	10k
112	109	110	107	103	96	98	94	93	93	91	90	88	85	81	79	80	76	79	78	78	79	82	83

Table 4.1 (b) – One-third octave band data

[dB ref. 20µPa]

All relevant parties will be present prior to the tests to witness the setting of the source noise levels to as close as the design case as possible. The music volume should be controlled as close as possible to the above spectrum limits. Some post-test analysis is expected to be required to correct to the appropriate levels.

BAR (GROUND FLOOR)

MCC have commented as follows:

"Noise levels for the ground floor/bar should be set for a typical city centre bar use."

Noise from Pubs and Club (Davies et. al) cites "Many bars playing music had noise levels of 90 – 95 dB L_{Aeq} during busy periods", but there are no spectral data to accompany this.

It has been agreed therefore to increase the overall volume to just achieve 95dB $L_{Aeq, T}$. N.B. It is understood that the temporary sound system installation will be arranged by 5th Leisure and provided by Blacka Acoustics Ltd. SCL will require a written description of the system for inclusion within the report. Music will be played through this system as is, i.e. without any boosting or reductions of any specific frequencies i.e. no use of graphic equalisers is deemed required or appropriate.

5.0 TESTING METHODOLOGY - RECEPTORS

5.1 MEASUREMENT LOCATIONS

There are 126 apartments in total; 22 on each of levels 1 to 4 inclusive, 20 on Level 5 and 18 on Level 6.

SCL has previously proposed a comprehensive regime of testing all 1st floor apartments and 10no 6th floor apartments, amounting to 20% of apartments. MG have since suggested that 1 in 10 (10%) would be considered sufficient, with MCC's position being that a comprehensive testing schedule would need to include a larger number of tests, spread across all floors.

The principle of selection of apartments for testing was discussed in detail between MG, SCL and MCC in a meeting on Tuesday 10th March 2020. The points of agreement were as follows:

1. Target up to 20% test rate (up to 32 of the 126 apartments);
2. The majority of tests are to be undertaken on Level 1;
3. A minimum of four apartments are to be tested on each of Levels 3 and 6.

The proposed schedule of tests is included in Appendix A.

5.2 MEASUREMENT PARAMETERS

The L_{eq} (equivalent continuous sound level) will be recorded in each apartment with and without the sound sources present. Spectral one-third octave band data will be obtained alongside the broadband A-weighted level.

As the apartments are furnished and occupied it is not considered necessary to allow for any corrections for reverberation, and as such we do not propose measuring reverberation times in the apartments.

5.3 MEASUREMENT POSITIONS AND DURATION

Testing positions are proposed (in the absence of more suitable guidance) with general reference to ANC Guidelines - Noise Measurements in Buildings, Part 1: *Noise from Building Services* and Part 2: *Noise from External Sources* (ANC-9701).

It was the view of SCL that whilst a moving microphone technique would be the best technique to address the variations in the sound field due to low frequency components (room modes), due to the layouts of the apartments being largely fixed (all apartments are furnished), it was considered more important to measure at fixed positions representative of normally-occupied head positions, than to obtain a spatial average. It was also considered important to measure over a meaningful period (in agreement with MCC who previously requested 5-minutes) that would allow various different music beats

and styles to be included (and it is not considered practical to use a swept moving microphone technique over longer sample periods).

Nevertheless, MG and 5th Leisure have both expressed a desire for the tests to be undertaken faster. The following measurement protocol has therefore been agreed on this basis.

Short spot measurements will be taken in three positions within each room at or as near as possible to the normally-occupied head positions described below, at the following approximate microphone heights:

- A. 0.8m¹ above the floor level (to represent a person lying down in bed);
- B. 1.2m above the floor level (to represent a person sitting);
- C. 1.5m above floor level (to represent a person standing).

Apart from the 0.8m 'bed' measurement, the microphones will be placed least 1 m away from any hard surfaces.

One swept measurement will also be taken from the centre point of each apartment.

The standard reference time sample period (t) will be set at a minimum of 10 seconds for spot measurements and a minimum of 30-seconds for the swept measurements.

For background sound measurements a moving microphone technique will be used in the centre of each test space over a minimum period of 30 seconds. N.B. to save time on site as required by MG and 5th Leisure it is proposed to only take background noise measurements in some apartments. This should provide enough data to enable comment on the likelihood of whether the other tests may have been influenced by background noise and, if so, any significance of this.

5.4 ADDITIONAL TESTING REQUIREMENTS

Prior to the tests it should be ensured that the apartment, nightclub and ground floor area windows and doors are fully closed to reduce to a minimum the possibility of any external sound paths.

6.0 ANALYSIS AND REPORT

6.1 DATA ANALYSIS

All the relevant measured data is stored within the memory of the sound level meters for later downloading and analysis.

Adjustments will be made to results as required to reflect the source noise level compared to the design criteria. In apartments where background noise levels have been measured, these results will be corrected for any influence of background noise to isolate the sound arising from the main club, from the bunker and from the ground floor sound systems to enable a more detailed review of the performance of the mitigation measures.

¹ Although the guidance suggests that measurements should not be taken within 1m of any reflective surface unless small room dimensions demand it, in this instance the risk of room modes and the fact that the source normally occurs at night whilst occupants are in bed in a lying-down position are considered over-riding factors to this general rule, thus a height of 0.8m is proposed. These adjustments to the 'normal' method are in accordance with the guidance.

N.B. As criteria have been set as maximum limits, the measurements in each apartment will not be averaged. Each measurement position will be reported separately.

6.2 TECHNICAL REPORT

A report will be issued by SCL evaluating the resultant measurement data in the context of the specified design criteria, and any areas of non-compliance will be highlighted. Full octave-band data for each apartment will be reported.

7.0 PROGRAMME

7.1 START-FINISH DATES

It is understood that the tests will require completion and reporting no later than 08/04/2020. At the time of writing 19th March 2020 has been identified as a potential test date although this is not yet confirmed.

7.2 WORKING HOURS

It is estimated that the testing could be completed within one working day. A rough timetable for testing is included in Appendix A.

7.3 ACCESS

We will require uninterrupted access to the nightclub and the apartments for the entire duration of the tests. All specified apartments would need to be empty of persons other than those directly involved in the testing. One or two additional technicians can be present for witnessing the tests, if deemed necessary, and one other person may need to be present to provide access to the apartments (e.g. if a master key cannot be supplied). No residents will be allowed in the flats during the measurements under any circumstances. Any persons within the circulation areas close to where the testing is taking place will not be able to converse with anything much louder than a whisper, and door slams must be avoided at all costs to avoid unnecessary delays in testing.

The apartments should be vacant for as long as possible on the testing dates. Whilst an outline testing schedule with estimated timings can be produced on an apartment by apartment basis, it cannot be relied upon and unforeseen circumstances may extend the period required for the testing. Any interruption to testing by occupants returning to their apartments early has the potential to be very disruptive and will only cause unnecessary further delays to other residents being able to return to their apartments. There would also be the introduction of security risks for the expensive (but small and highly portable) survey equipment that will be used for testing. In order to undertake the testing as efficiently as possible, the entire floors being tested should be deemed *no access* zones for the periods specified.

A detailed timetable of testing will be provided prior to the tests to enable prior warning to residents of the tests.

There will be no restrictions on the number of personnel present in the nightclub on the basis that staff are instructed not to tamper with either the sound systems or noise monitoring equipment under any circumstances. For any personnel spending the day in the nightclub overseeing the source noise measurements it is advisable that hearing protection be worn.

8.0 COMPETENCIES

Sound measurements will be carried out by a suitably qualified acoustician. As a minimum they will hold a higher acoustics qualification, and have AMIOA membership status. Where AMIOA consultants are working, an MIOA consultant will be present to oversee the work.

9.0 KEY PERSONNEL

The team proposed to complete the testing currently comprises:

- 1 x MIOA consultant.

Additionally, the following key personnel will be required:

- A representative from Dwell to provide access to the apartments;
- A representative from 5th Leisure to provide access to Fifth nightclub and to operate the two sound systems;
- A representative from MCC to witness the testing;
- A representative from 5th Leisure's acoustic consultancy team to witness (and/or help with) the testing.

10.0 EMERGENCY PROCEDURES / HEALTH & SAFETY

All site rules regarding emergency procedures will be followed. N.B. Fire safety and any other site-specific rules are to be overseen by others.

N.B. Potential risks associated with the Coronavirus Disease 2019 (COVID-19) outbreak have been identified and discussed, and measures will be taken during the tests to protect test personnel insofar as is deemed appropriate, necessary and practical.

11.0 QUALITY

Sound pressure level measurements will be obtained using instrumentation complying with the Class 1 specification of BS EN 61672:2003. Current calibration certificates will be made available on request.

The noise monitoring meters will be calibrated on site using a microphone calibrator compliant with IEC 60942:2003 Class 1 or Class 2 before and after the noise measurements, with a record kept of calibration values. If the calibration has drifted by more than 0.5 dB during the testing, the measurements will be deemed void, and the testing will need to be repeated.

If required, the equipment will also be calibrated under the circumstances outlined in paragraph 4.3 of ANC-9701-1 (if they arise during the testing period).

12.0 LOGISTICS

Equipment will be lightweight, portable and battery-powered. No special measures are required to move the equipment around the building.

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For **SOUND** CONSULTING LIMITED

APPENDIX A

Test Schedule

Floor Level	Test ref	Time estimate	Source	Receive	Notes 1	Notes 2	Column?	Location
1	1M01a	1pm-2pm	Main club only	101 LR	Directly above new staircase between mezzanine and ground floors	Abutts main lift stairwell	Y	North façade
	1M01b			101 Bed	Directly above new staircase between mezzanine and ground floors	Abutts main lift stairwell	Y	North façade
	1M03			103	Half above Bunker - half above auxiliary areas		Y	North façade
	1M05			105	Above auxiliary areas			North/East Corner
	1M07			107	Above auxiliary areas			East side
	1M09			109	Above auxiliary areas	Abutts SE stairwell		South Façade
	1M11			111	Half main club void, half auxiliary areas		Y	South Façade
	1M13			113	Half main club void, half auxiliary areas			South Façade
	1M15			115 Bed	Half main club void, half auxiliary areas		Y	SW Corner
	1M17			117	Near new staircase and mezzanine balcony		Y	West Façade
	1M19			119	Near new staircase and mezzanine balcony		Y	West Façade
	1M20			120	Near new staircase and mezzanine balcony			West Façade
	1M23			123	Directly above double height Bunker	Abutts main lift stairwell	Y	NW Corner
	1B01a	2pm-3pm	Bunker only	101 LR	Directly above new staircase between mezzanine and ground floors	Abutts main lift stairwell	Y	North façade
	1B01b			101 Bed	Directly above new staircase between mezzanine and ground floors	Abutts main lift stairwell	Y	North façade
	1B03			103	Half above Bunker - half above auxiliary areas		Y	North façade
	1B05			105	Above auxiliary areas			North/East Corner
	1B07			107	Above auxiliary areas			East side
	1B09			109	Above auxiliary areas	Abutts SE stairwell		South Façade
	1B11			111	Half main club void, half auxiliary areas		Y	South Façade
	1B13			113	Half main club void, half auxiliary areas			South Façade
	1B15			115 Bed	Half main club void, half auxiliary areas		Y	SW Corner
	1B17			117	Near new staircase and mezzanine balcony		Y	West Façade
	1B19			119	Near new staircase and mezzanine balcony		Y	West Façade
	1B20			120	Near new staircase and mezzanine balcony			West Façade
	1B23			123	Directly above double height Bunker	Abutts main lift stairwell	Y	NW Corner
	1F01a	3pm-4pm	Fifth only	101 LR	Directly above new staircase between mezzanine and ground floors	Abutts main lift stairwell	Y	North façade
	1F01b			101 Bed	Directly above new staircase between mezzanine and ground floors	Abutts main lift stairwell	Y	North façade
	1F11			111	Half main club void, half auxiliary areas		Y	South Façade
	1G01a		Ground floor only	101 LR	Directly above new staircase between mezzanine and ground floors	Abutts main lift stairwell	Y	North façade
	1G01b			101 Bed	Directly above new staircase between mezzanine and ground floors	Abutts main lift stairwell	Y	North façade
	1G07			107	Above auxiliary areas			East side
	1G11			111	Half main club void, half auxiliary areas		Y	South Façade
	1G13			113	Half main club void, half auxiliary areas			South Façade
	1G15			115 Bed	Half main club void, half auxiliary areas		Y	SW Corner
	1G20			120	Near new staircase and mezzanine balcony		Y	West Façade
	1A01a		ALL	101 LR	Directly above new staircase between mezzanine and ground floors	Abutts main lift stairwell	Y	North façade
	1A01b			101 Bed	Directly above new staircase between mezzanine and ground floors	Abutts main lift stairwell	Y	North façade
	1A07			107	Above auxiliary areas			East side
	1A11			111	Half main club void, half auxiliary areas		Y	South Façade
	1A13			113	Half main club void, half auxiliary areas			South Façade
	1A15			115 Bed	Half main club void, half auxiliary areas		Y	SW Corner
	1A20			120	Near new staircase and mezzanine balcony		Y	West Façade
	3A15	4pm-5pm		315 Bed	Half main club void, half auxiliary areas		Y	South Façade
	3A20			320	Near new staircase and mezzanine balcony		Y	West Façade
	3G01		Ground floor only	301	Directly above new staircase between mezzanine and ground floors	Abutts main lift	Y	North façade
	3G07			307	Above auxiliary areas			East side
	3G11			311	Half main club void, half auxiliary areas		Y	South Façade
	3G15			315 Bed	Half main club void, half auxiliary areas		Y	SW Corner
	3G20			320	Near new staircase and mezzanine balcony		Y	West Façade
	3F01		Fifth only	301	Directly above new staircase between mezzanine and ground floors	Abutts main lift	Y	North façade
	3F07			307	Above auxiliary areas			East side
	3F11			311	Half main club void, half auxiliary areas		Y	South Façade
	3F15			315 Bed	Half main club void, half auxiliary areas		Y	SW Corner
	3F20			320	Near new staircase and mezzanine balcony		Y	West Façade
	6F01	5pm-6pm		601	Directly above new staircase between mezzanine and ground floors	Abutts main lift	Y	North façade
	6F06			606	Above auxiliary areas			East side
	6F09			609	Half main club void, half auxiliary areas		Y	South Façade
	6F13			613	Half main club void, half auxiliary areas		Y	SW Corner
	6F16			616	Near new staircase and mezzanine balcony		Y	West Façade
	6G01		Ground floor only	601	Directly above new staircase between mezzanine and ground floors	Abutts main lift	Y	North façade
	6G06			606	Above auxiliary areas			East side
	6G09			609	Half main club void, half auxiliary areas		Y	South Façade
	6G13			613	Half main club void, half auxiliary areas		Y	SW Corner
	6G16			616	Near new staircase and mezzanine balcony		Y	West Façade
	6A06		ALL	606	Above auxiliary areas			East side
	6A16			616	Near new staircase and mezzanine balcony		Y	West Façade

APPENDIX B

Sample Site Measurement Record

Consultant name / Signature:

Date:

Test Reference	Measurement period		Measurement File Numbers				Notes	Background Measurement (if applicable)
	Start	Finish	A: Bed 10s (0.8m height)	B: Sitting 10s (1.2m height)	C: Standing 10s (1.5m height)	D: 30s sweep (centre flat)		File Number
1M01								
1M03								
1M05								
1M07								
1M09								
1M11								
1M13								
1M14								
1M17								
1M19								
1M22								
1M23								
1B01								