PEAK acoustics

Noise Assessment Report

Rev. 0 22/02/2019

Noise Impact Assessment

Project Reference Number: PA779

Assessment Standard: BS4142:2014

Client: Ben Froud

Site: 196 Tottenham Court Rd, London W1T 7PJ

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Project Information

Peak Acoustics have been commissioned to undertake the assessment detailed within this report. Below is a summary of pre-commencement requirements and comments as communicated to Peak Acoustics by involved parties, this information forms the basis of the assessment and report.

Client Contact	Ben Froud of Retail Design Solutions Ltd.
Client Requirement	A Noise Impact Assessment is required to demonstrate that noise from the installation of two Mitsubishi Power Inverter units will not cause adverse noise impacts upon nearby Noise Sensitive Receptors.
Site details as communicated by client.	The units are to be installed at roof level at the Heals Building at 198 Tottenham Court Rd, London amongst a plant compound.
Selected Methodology	'BS4142:2014 – Methods for rating and assessing industrial and commercial sound'
Methodology Justification	BS4142:2014 is a recognised standard for determining the noise impact of fixed plant machinery via relation of emissions to the measured background noise levels on site.
Local Authority Contact	N/A
Local Authority Consultation	N/A
Local Authority Guidance/Unitary Development Plans/Unique or bespoke standards	The policy typically adopted by Local Authority's in London is that noise emissions from the proposed plant are to be at least 10 dB below the current representative background level ($L_{A90,T}$) as calculated at the nearest Noise Sensitive Receptor.

Assessment Summary

A Noise Assessment has been undertaken on behalf of Retail Design Solutions in relation to the proposed installation of 2 No. Mitsubishi Power Inverter Units at 196 Tottenham Court Rd, London.

Background noise surveys were undertaken from 30th – 31st January 2019 to obtain measurements of the existing noise climate representative of nearby Noise Sensitive Receptors (NSRs), which have been identified as the commercial office windows immediately to the north of the site location and hotel windows at a further distance to the north.

The existing noise climate on-site is dominated by plant equipment noise from air-handling and extraction equipment; background noise levels were measured at their lowest at 59 dB $L_{A90,1hr}$.

A BS4142:2014 assessment was conducted, and the cumulative Rating Level for the proposed equipment was calculated at 44.6 dB L_{Ar}. This is 14.4 dB below the representative background noise level at the worst-affected receiver location, indicative of a 'Low Impact'. It has been determined that no mitigation against noise is necessary in order to limit adverse impacts upon nearby Noise Sensitive Receptors.

1. Proposed Noise Sources

1.1 It is proposed to install two Power Inverter Heat Pumps at roof level. Make and model information is summarised in **Table 1.**

Table 1: Proposed Noise Sources

Ref.	Description
AC1	Mitsubishi PUZ-ZM100VKA Power Inverter Heat Pump (Outdoor Unit)
AC2	Mitsubishi PUZ-ZM100VKA Power Inverter Heat Pump (Outdoor Unit)

1.2 The units are to be installed at the locations marked in red on **Figure 1.**

2. Subjective Impressions

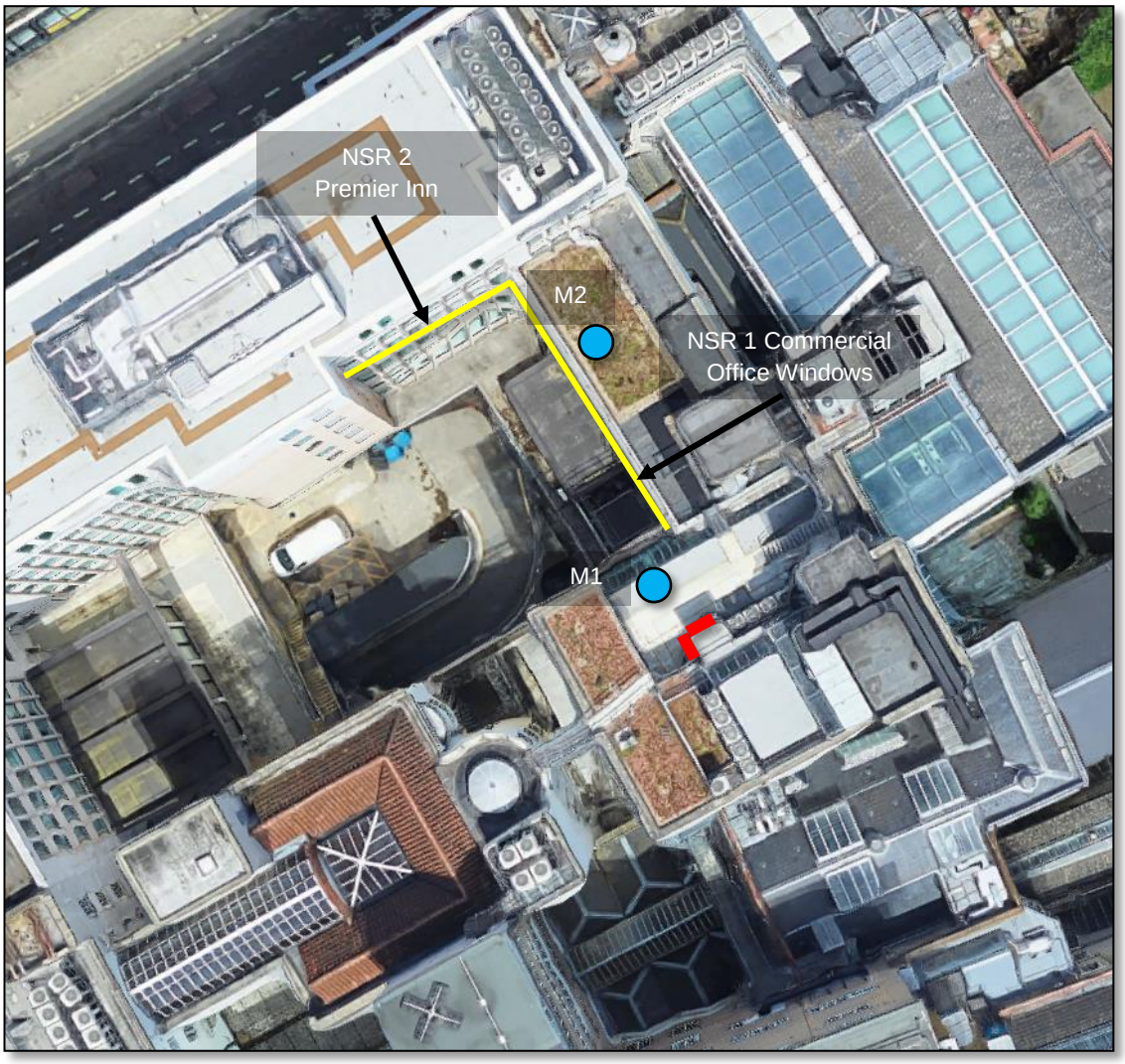
2.1 The existing noise climate on-site is dominated by existing air-handling plant and extraction terminals. The environment is acoustically reflective, resulting in similar noise levels at various points around the accessible roof areas.

3. NSR and Measurement Locations

3.1 The office windows immediately to the north of the proposed plant location and the hotel windows of the Premier Inn building have been identified as Noise Sensitive Receptor locations. There is a small kitchen area immediately to the west of the proposed location of the equipment although this has not been deemed to be noise-sensitive.

3.2 The site, NSR and monitoring locations are shown below.

Figure 1: Measurement and NSR Locations



4. Measurement Procedure

4.1 An unattended background noise survey was undertaken at position M1 over a period of approximately 24 hours from 30th – 31st January 2019. The noise climate at this position was deemed representative of the NSR facades.

4.2 A comparative attended measurement was taken at position M2 in order to compare existing plant noise levels at this position.

4.3 Measurements of $L_{Aeq,T}$ and $L_{A90,T}$ were logged in 1-min intervals for M1 and 15s intervals for M2.

4.4 At all positions the microphone was placed approximately 1.6m from roof level.

5. Measurement Equipment

5.1 Measurements were obtained using Class 1 instrumentation. Full equipment details are given in **Appendix B**.

5.2 Equipment was calibrated before and after use and no significant drift occurred during measurements. Full calibration details are provided in **Appendix D**.

6. Weather Conditions

6.1 Weather conditions were dry with temperatures of 4°C and light winds of 2 – 4 m/s, and were deemed suitable for conducting environmental noise measurements; details can be found in **Appendix C**.

7. Background Sound Level

7.1 The measured noise survey results are shown graphically in **Appendix E** and demonstrate that the residual noise climate is comprised of plant equipment running at a consistent average level throughout the day and night.

7.2 The comparative measurement at position M2 confirmed that existing plant noise levels at this location are consistent with those at position M1 with similar results recorded over adjacent time periods.

7.3 The lowest background noise levels recorded during the noise survey are summarised below. It is demonstrated that existing noise levels are equally as high at night compared to the daytime.

Table 2: Lowest Background Noise Levels

Location	Day/ Night	Reference Time Interval	Period	Background, dB $L_{A90,T}$
M1	Daytime (07:00 – 23:00)	1-hr	15:30 – 16:30 on 30/01/19	59
M1	Night-time (23:00 – 07:00)	15-min	01:45 – 02:00 on 31/01/19	60

8. Specific Sound Level

8.1 Source noise levels are determined using the manufacturer noise data for the equipment which is shown in **Appendix H**.

8.2 Noise levels have been calculated at the shortest distance from the proposed plant equipment to façade of NSR 1.

8.3 The predicted Specific Sound Levels are summarised in **Table 3** below with the full calculation method shown in **Appendix F**:

Table 3: Specific Sound Levels

Noise Source	Specific Sound Level, dB L_{As}
AC 1 PUZ-ZM100KVA	38.0
AC 2 PUZ-ZM100KVA	39.1

9. Rating Level

9.1 In accordance with BS4142:2014, the Specific Sound Level may be corrected for characteristics that make the sound more noticeable at the NSR location such as tonality, impulsivity and intermittency.

9.2 The output of the AC equipment may vary over time, in response to temperature changes. Whilst it is unlikely that receivers would distinguish this intermittency to the noise, a +3 dB has been applied as a precaution.

9.3 Noise from the proposed type of air handling plant is typically broadband in nature with no transient component. No corrections for tonality or impulsivity are applied.

9.4 The Rating Levels of equipment are summarised in **Table 4**. Sources are summed logarithmically to give a total Rating Level.

Table 4: Rating Level Calculations

Noise Source	Specific Sound Level, dB L_{As}	Total BS4142 Corrections	Source Rating Level, dB L_{Ar}	Total Rating Level, dB L_{Ar}
AC 1 PUZ-ZM100KVA	38.0	+ 3.0	41.0	**44.6**
AC 2 PUZ-ZM100KVA	39.1	+ 3.0	42.1	

9.5 The above calculations are made to NSR 1; NSR 2 is located at a further distance from the proposed plant and as such the Rating Level is likely to be lower.

10. Rating Level Vs Background

10.1 BS4142:2014 describes the relationship between the Rating Level and background noise level as:

- A difference of around +10 dB or more is likely to be an indication of a significantly adverse impact.
- A difference of around +5 dB is likely to indicate an adverse impact.
- Where the rating level does not exceed the background level, this may be considered 'Low Impact', dependent on the context.

10.2 The Rating Level is **14.4 dB** below the background noise level and therefore the initial estimation is that the noise impact would be low.

10.3 Calculations have thus far been made to the closest NSR (NSR 1). NSR 2 is located at a further distance from the proposed plant and as such the noise impact is likely to be lower.

11. Context

11.1 The character and frequency content of the noise source being introduced aligns with that of the existing noise climate, which is dominated by air handling and extraction equipment. This is likely to result in a lower noise impact in comparison to the introduction of a different type of noise source.

11.2 No contextual factors which would significantly alter the initial estimation of the noise impact have been identified.

12. Conclusion

12.1 A Noise Impact Assessment has been conducted at 196 Tottenham Court Rd, London in relation to the proposed installation of 2 No. Mitsubishi PUZ-ZM Series Power Inverter Units. The units are to be installed within an existing plant compound containing 12 existing air-conditioning units. There are also several extract flues in the immediate vicinity at roof level.

12.2 Noise Sensitive Receptors have been identified as office windows immediately to the north of the proposed plant location and the windows of Premier Inn to the north at a further distance.

12.3 The assessment found that the installation of the units is likely to have a 'Low Impact', indicated by a Rating Level 14.4 dB below the representative background noise level. The proposal is therefore unlikely to result in adverse noise impacts upon nearby Noise Sensitive Receptors.

13. Uncertainty

13.1 Calibration drift was monitored, and it is demonstrated that minimal drift occurred throughout the measurement process.

13.2 Measurements were undertaken over a single weekday period therefore lower background noise levels could occur over longer-term periods. Uncertainty in this regard is offset by measuring in weather conditions conducive to obtaining lower background noise levels; conditions were dry with negligible winds.

13.3 Uncertainty can arise when distance-correction formulas are used to predict the propagation of sound, however it is an accepted method when the noise source is proposed. Uncertainty in this regard is offset by considering continuous operation at maximum capacity for both AC Units. For most of the time, the noise output is likely to be lower.

13.4 Working towards a target of 10 dB below background level offsets uncertainty to some degree; BS4142:2014 indicates that adverse impacts are likely to arise when the noise source exceeds the background level by 5 dB (dependent on the context).

APPENDIX A – Measurement Details

Measurement	Kit	Start Date	Start Time	End Date	End Time
M1	A3	30/01/19	12:51	31/01/19	12:32
M2	A3	30/01/19	12:30	30/01/19	12:40

APPENDIX B - Equipment Details

Kit	Equipment	Make	Model	Class	Serial Number
A3	Sound Meter	Svantek	971	1	41980
A3	Pre-Amp	Svantek	SV18	1	44331
A3	Calibrator	Svantek	SV31	1	90274

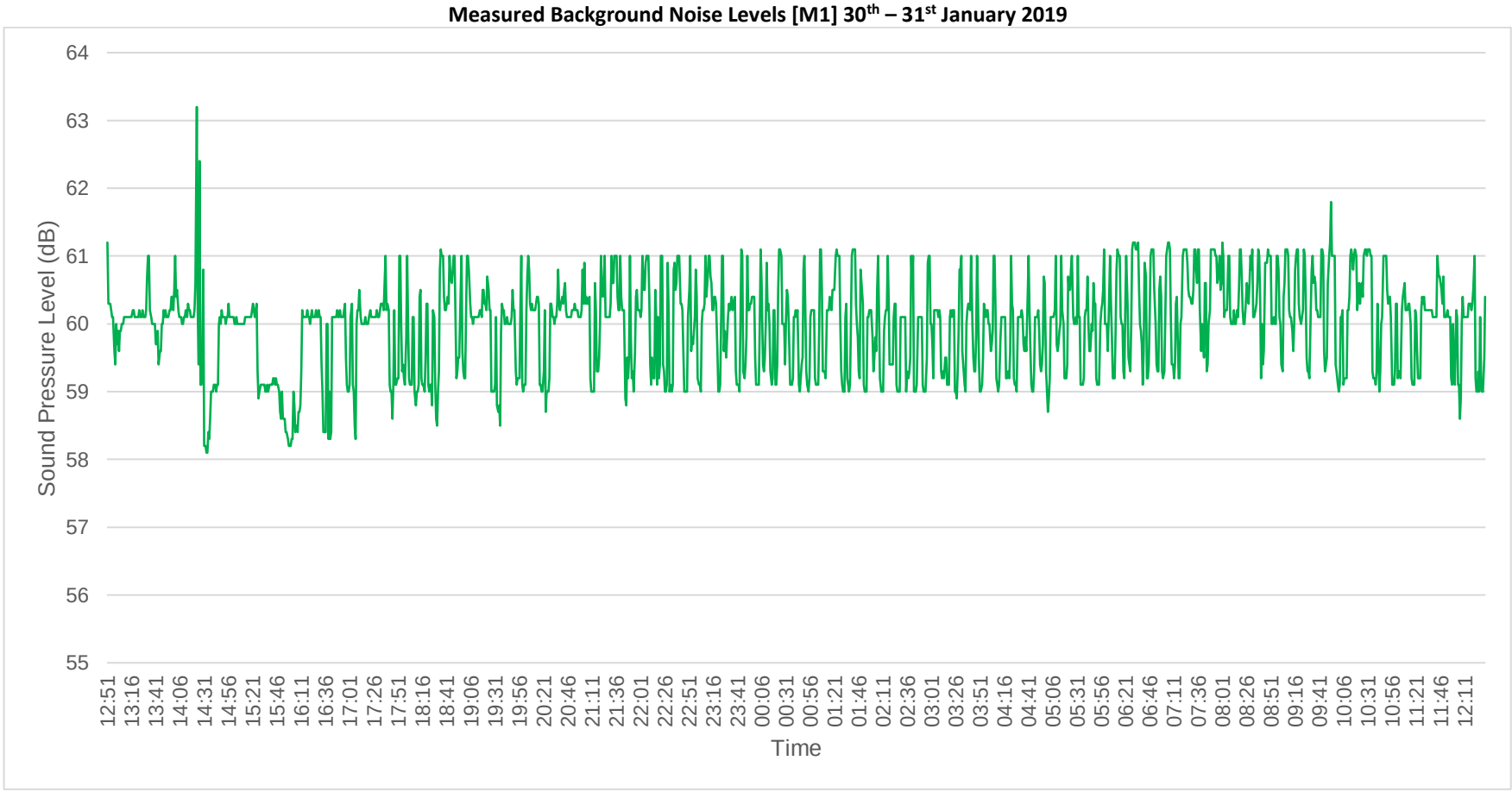
APPENDIX C - Meteorology Details

Date	Temp C	Wind Speed m/s	Wind Direction	Humidity %	Precipitation mm	Cloud Cover (Oktas)
30/01/19	3	2 - 4	N	70	0.0	1/8
31/01/19	4	2 - 4	E	90	0.0	3/8

APPENDIX D - Calibration Details

Measurement	Calibrator Ref Level (dB)	Level Before (dB)	Deviation Before (dB)	Level After (dB)	Deviation After (dB)
M1	113.8	113.2	0.6	113.1	0.7
M2	113.8	113.2	0.6	113.1	0.7

APPENDIX E – Noise Survey Results



APPENDIX F – Calculations

Distance Correction using Sound Power Level:

$$L_{pA} = L_{wA} + 10Log\left[\frac{Q}{4\pi r^2}\right] - A_{shielding}$$

							BS4142 Corrections				Total		
Item	**Source**	**Sound Power Level**	**r (to NSR)**	**Q Factor**	**Shielding**	**Specific Sound**	**Tonal'y**	**Impul'y**	**Inter'y**	**Rating Level**	**Rating Level**	**BG**	**Diff.**
Ref.	*Outdoor Unit*	*dB LwA*	*m*		*dB*	*dB LAs*	*dB*	*dB*	*dB*	*dB LAr*	*dB LAr*	*dB LA90,T*	*dB*
AC 1	PUZ-ZM100VKA	69	8	2	-5	38.0	0	0	3	41.0	-	-	-
AC 2	PUZ-ZM100VKA	69	7	2	-5	39.1	0	0	3	42.1	44.6	59	-14.4

Notes

- Shielding assumed as proposed units are located on higher elevation to nearest office windows; a minimum 5 dB is assumed, corresponding to a partial blocking of the line-of-sight.
- Q factor = 2, units placed on a hard-reflective surface.

APPENDIX H – Manufacturer Noise Data

PUZ-ZM - OUTDOOR UNITS		PUZ-ZM50VKA	PUZ-ZM60VHA	PUZ-ZM71VHA	PUZ-ZM100VKA	PUZ-ZM125VKA	PUZ-ZM140VKA
SOUND PRESSURE LEVEL (dBA)	Heating/Cooling	46 / 44	49 / 47	49 / 47	51 / 49	52 / 50	52 / 50
SOUND POWER LEVEL (dBA)	Cooling	65	67	67	69	70	70
WEIGHT (kg)		46	70	70	116	116	118
DIMENSIONS (mm)	Width x Depth x Height	809 x 300 x 630	950 x 330 + 25 x 943	950 x 330 + 25 x 943	1050 x 330 + 40 x 1338	1050 x 330 + 40 x 1338	1050 x 330 + 40 x 1338
ELECTRICAL SUPPLY		220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz
PHASE		Single	Single	Single	Single	Single	Single
SYSTEM POWER INPUT (kW)	Heating/Cooling (nominal)	1.361 / 1.25	1.745 / 1.521	2.156 / 1.829	3.018 / 2.317	3.954 / 3.846	4.432 / 3.941
	Heating/Cooling (UK)	1.21 / 1.06	1.55 / 1.29	1.92 / 1.55	2.41 / 1.99	3.51 / 3.26	3.94 / 3.35
STARTING CURRENT (A)		5.0	6.0	6.0	13.0	13.0	13.0
SYSTEM RUNNING CURRENT (A)	Heating/Cooling [MAX]	5.95 / 5.37 [13.4]	7.43 / 6.48 [19.4]	9.23 / 7.81 [19.4]	12.97 / 9.97 [27.2]	16.87/ 16.46 [27.3]	18.76 / 16.66 [28.9]
FUSE RATING (BS88) - HRC (A)		16	25	25	32	32	40
MAINS CABLE NO. CORES		3	3	3	3	3	3
MAX PIPE LENGTH (m)		50	55	55	100	100	100
MAX HEIGHT DIFFERENCE (m)		30	30	30	30	30	30
CHARGE REFRIGERANT (kg) / CO_2 EQUIVALENT (t)	R32 (GWP 675) - 30m	2.00 / 1.35	2.80 / 1.89	2.80 / 1.89	4.00 / 2.70	4.00 / 2.70	4.00 / 2.70
MAX ADDITIONAL REFRIGERANT (kg) / CO_2 EQUIVALENT (t)	R32 (GWP 675)	0.30 / 0.20	0.80 / 0.54	0.80 / 0.54	2.80 / 1.89	2.80 / 1.89	2.80 / 1.89

PEAK acoustics

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Peak Acoustics formed in 2011, we are a fully accredited specialist consultancy and testing organisation.

We are a diverse team of Acoustic Consultants, Specialist Engineers and Building Compliance Technicians, with a network spanning the UK. We are proud to offer our services nationally, with no job too big or small.

We provide Acoustic Consultancy, Building Compliance Testing and Energy Services.

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We offer an extensive range of services in the sectors of Acoustic Consultancy, Building Compliance & Energy Efficiency. We are able to put together custom packages combining multiple services which saves both time and money for you.

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- **Air Tightness Testing**
- **Ventilation Testing**
- **Water Efficiency Calculations**
- **Sound Insulation Specification**

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- **EPC's**
- **SBEM Calculations**
- **Energy Statements**
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Acoustic Consultancy

- **Noise Assessment for planning conditions**
- **Construction site noise monitoring**
- **Noise at work assessments**
- **Noise & Vibration Impact Assessments**

Peace of mind

We are accredited and registered by all the relevant major UK authorities to provide the services we offer. Peak Acoustics is UKAS accredited for sound insulation testing, ATTMA registered for Air Leakage Testing. and our Energy team are all Domestic On-Completion Energy Assessors.

OUR ADDED VALUE

We combine our detailed knowledge of building regulations with our technical understanding of building physics, acoustics and environmental sciences to maximise development quality. Our work ensures appropriate strategies and studies are prepared to demonstrate to demonstrate to local authorities how proposed developments will be of high quality and generate acceptable impact on the surrounding environment.

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