

**RBS Reading
4-6 Broad Street
RG1 2BH**

**Environmental Noise Survey
and Plant Noise Assessment Report**

26861/PNA1

18 December 2019

For:
ISG Plc
33 Aldgate High Street
London
EC3N 1AG



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Environmental Noise Survey and Plant Noise Assessment Report 26861/PNA1

Document Control

Rev	Date	Comment	Prepared by	Authorised by
0	18/12/2019	First issue		
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Environmental Noise Survey and Plant Noise Assessment Report 26861/PNA1

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1.0 Introduction

It is proposed to undertake a refurbishment of 4-6 Broad Street, Reading. This refurbishment includes the conversion of the ground floor and the first floor of the existing building, which comprises retail and office space, into a bank. To serve the development, it is proposed to install a new condenser unit within the rear courtyard of the development site.

Hann Tucker Associates have therefore been commissioned to undertake an environmental noise survey and plant noise assessment to support the planning application.

This report presents the methodology and findings of our noise survey and assessment.

2.0 Objectives

To inspect the site to familiarise ourselves with its layout and surroundings in order to identify suitable accessible locations for environmental noise measurements.

To establish by means of an unmanned 24 hour survey the existing L_{Amax} , L_{Aeq} and L_{A90} environmental noise levels at up to 1No. secure and accessible on-site position, using fully computerised noise monitoring equipment.

Measurement procedures shall be in general accordance with those described in BS 4142: 2014, Method for rating industrial noise affecting mixed residential areas, published by the British Standards Institution.

The survey will enable noise emission limits from the development to be identified with reference to the requirements of the Local Authority and the application of BS 4142: 2014 and to minimise the possibility of noise nuisance by neighbours.

To assess the noise emissions from the proposed plant based upon data with which we are provided and comment upon the acceptability.

To advise on noise control measures if required with reference to the requirements of the Local Authority.



3.0 Site Description

3.1 Location

The site is located at 4-6 Broad Street, Reading. The location is shown in the Location Map below.



Location Map (maps.google.co.uk).

The site falls within the jurisdiction of Reading Borough Council.

3.2 Description

The site comprises retail space at ground level and three upper office floors. It is proposed to refurbish the ground floor and the first floor. The adjacent buildings to the east and west are similar to 4-6 Broad Street in height and use. To the south is Broad Street (pedestrian road) and to the north there is an external courtyard shared by the existing buildings.

The site is shown in the Site Plan overleaf.



Site Plan (maps.google.co.uk)

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Project Proposals

5.1 Proposed Plant

We understand the proposed plant comprises 1No. REYQ12U Daikin condenser unit.

5.2 Operating Hours

We understand that the operating hours of the proposed plant are as detailed in Section 11 of this report.

5.3 Drawings

Our acoustic analyses is based on the information provided by ISG Plc.



6.0 Acoustic Standards and Guidelines

6.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

“Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.”*

The Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.



The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *“all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development.”* The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

6.2 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) was first published in March 2012. This document replaced the existing Planning Policy Guidance Note 24 (PPG24) “Planning and Noise”. A new edition of NPPF was published in July 2018 and comes into effect immediately. This new edition however, contains no new directions with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the July 2018 edition.

Paragraph 170 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by (amongst others) *“preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability.”*

The following paragraphs are from the NPPF (revised February 2019):

“180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

182. Planning policies and decisions should ensure that new development can be integrated



effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

Paragraph 180 also references the Noise Policy Statement for England. This document does not refer to specific noise levels but instead sets out three aims:

"Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development."

The NPPF document does not refer to any other documents or British Standards regarding noise other than the NPSE.

Paragraph 2 of the NPPF states that *"planning law required that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*

Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed."*



6.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at <http://planningguidance.planningportal.gov.uk/blog/guidance/>. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:

Perception	Examples of Outcomes	Increasing effect level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

6.4 Local Authority Requirements

The site lies within the jurisdiction of Reading Borough Council. We understand their advice regarding criteria for atmospheric noise emissions from building service plant is based on BS 4142:2014, and the assessment must demonstrate that external plant does not exceed a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level.



6.5 BS 4142:2014

When setting plant noise emission criteria reference is commonly made to BS 4142: 2014 *“Methods for rating and assessing industrial and commercial sound”*.

The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains “a tone, impulse or other characteristic” then various corrections can be added to the specific (source) noise level to obtain the “rating level”.

BS 4142 states that: *“The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs”*. An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:

- *“Typically, the greater this difference, the greater the magnitude of the impact.”*
- *“A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.”*
- *“A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.”*
- *“The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.”*

The determination of the “rating level” and the “background level” are both open to interpretation, depending on the context.

In summary it is not possible to set plant noise emission criteria purely on the basis of BS 4142:2014. It is reasonable to infer from the above, however, that a difference of around -5dB corresponds to “No Observed Effect Level” as defined in the Noise Policy Statement for England. It is also reasonable to infer from the above that if the plant noise rating level does not exceed the existing background noise level outside any noise sensitive residential window then the plant noise is of “low impact”.



6.6 World Health Organisation Guidelines on Community Noise

BS8233:2014 is based upon the current World Health Organisation (WHO) guidance “*Guidelines on Community Noise*”. A summary of the noise guidelines relevant to the proposed scheme is presented in the table below.

Residential Environment	Critical Health Effect(s)	L _{Aeq}	L _{AFmax}	Time Base
Outdoor living area	Serious annoyance, daytime and evening	55	-	07:00-23:00
	Moderate annoyance, daytime and evening	50	-	07:00-23:00
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	-	07:00-23:00
Inside bedrooms	Sleep disturbance, night-time	30	45	23:00-07:00
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	60	23:00-07:00

These WHO guidelines are based, in almost all cases, on the lower threshold below which the occurrence rates of any particular effect can be assumed to be negligible.

6.7 British Standard BS8233: 2014

British Standard 8233: 2014 “Guidance on sound insulation and noise reduction for buildings” provides guidance for the control of noise in and around buildings.

BS8233:2014 Section 7.7.2 titled “Internal ambient noise levels for dwellings” states:

“In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 - 23:00	23:00 - 07:00
Resting	Living Rooms	35 dB L _{Aeq,16hour}	-
Dining	Dining Room/Area	40 dB L _{Aeq,16hour}	-
Sleeping (Daytime Resting)	Bedroom	35 dB L _{Aeq,16hour}	30 dB L _{Aeq,8hour}



6.8 Statutory Noise Nuisance

There is no quantitative definition of statutory noise nuisance. It is generally accepted however, that if the plant noise level is at least 5dB (or 10dB if tonal) below the minimum background $L_{90(15\text{minutes})}$ at 1m from the nearest noise sensitive residential window, then the risk of a statutory noise nuisance is avoided. By adopting this as a design criterion the guidance contained in BS 4142:2014 should also be complied with.

7.0 Survey Methodology

The survey was undertaken by Rodrigo Espinosa-Garcia, MSc, BSc(Hons), MIOA.

7.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 10:30 hours on Tuesday 3 December 2019 to approximately 10:30 hours on Friday 7 December 2019.

During the periods we were on site the wind conditions were calm. The sky was generally patchy. We understand that generally throughout the survey period the weather conditions were similar to this. These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over 15 minute periods.

7.2 Measurement Position

The sound level meter was located at the rear courtyard near the existing fire door of the development site. The microphone was attached to a pole and this mounted at the façade approximately two and a half metres above ground level and approximately one metre from the façade in non-free field conditions.

The following plan shows the approximate location of the measurement position (yellow mark).



Plan Showing Measurement Positions (maps.google.co.uk)

7.3 Instrumentation

The instrumentation used during the survey is presented in the table below:

Description	Manufacturer	Type	Serial Number	Calibration
Type 1 ½" Condenser Microphone	PCB	377B02	122885	Calibration on 09/10/2019
Preamp	Larson Davis	PRM902	3692	Calibration on 09/10/2019
Type 1 Data Logging Sound Level Meter	Larson Davis	824	3444	Calibration on 09/10/2019
Type 1 Calibrator	Bruel & Kjaer	4231	2610161	Calibration on 19/09/2019

The sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes was found to have occurred (no more than 0.1dB).

The sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable.

The microphone was fitted with a windshield.



8.0 Results

The results have been plotted on Time History Graphs 26861/TH1 enclosed, presenting the 15 minute A-weighted (dBA) L_{90} and L_{eq} noise levels at the measurement position throughout the duration of the survey.

The lowest L_{A90} (15 min) measurements recorded during the survey are presented in the table below:

Date	Lowest Measured $L_{A90(15min)}$ Background Noise Level (dB re 2×10^{-5} Pa)		
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours	24 Hours
04/12/2019	46*	44	44
05/12/2019	47	44	44
06/12/2019	56*	N/A	N/A

*Incomplete period.

BS4142 states that the background noise should not automatically be assumed to be represented by either the lowest or the mode of the measured L_{A90} noise levels. Based on our analysis of the histograms showing the distribution of background L_{A90} noise levels over the duration of the survey, we suggest that the representative background noise levels used in the assessment should be as presented in the table below.

Representative L_{A90} Background Noise Level (dB re 2×10^{-5} Pa)
Daytime (07:00 – 23:00) Hours
46

9.0 Discussion Of Noise Climate

Owing to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However at the beginning and end of the survey period the dominant noise source was noted to be existing building services plant serving the surrounding sites.

10.0 Plant Noise Emission Criteria

On the basis of the above and the results of the environmental noise survey, we propose that the following plant noise emission criteria be achieved at 1 metre from the nearest noise sensitive window.



Noise Emission Limit (dBA)		
Daytime (07:00 - 23:00) hours	Night-time (23:00 - 07:00) hours	24 hours
41	39	39

The above criteria are to be achieved with all proposed plant operating simultaneously.

If plant contains tonal or impulsive characteristics the external design criteria should be reduced by 5dBA. Plant noise shall be assessed in accordance with BS 4142: 2014.

It should be noted that the above are subject to the final approval of the Local Authority.

11.0 Plant Noise Impact Assessment

We understand the proposed plant comprises 1No. REYQ12U Daikin condenser unit.

11.1 Plant Noise Data

We understand the manufacturer's noise data for the equipment to be as follows:

Plant Description	Sound Pressure Level (dB re 2×10^{-5} Pa) at 1 metre at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
REYQ12U	64	66	62	58	53	52	54	44	61

11.2 Location of Plant

It is proposed to install the proposed condenser unit at the rear courtyard next to the fire exit door at ground level.

We understand the nearest noise sensitive window will be located to the east of this courtyard at approximately four metres from the condenser unit.

We have been informed that the proposed plant item should be operational during the daytime (07:00 hours to 23:00 hours) only.

11.3 Assumptions

Our assessment has been based on the worst case assumption that plant could be running continuously during the daytime (07:00 hours to 23:00 hours).



11.4 Mitigation Measures

In order to control plant noise emissions in line with the proposed criterion, we recommend the proposed condenser unit should be attenuated by at least 15dB. This could be achieved by setting the unit in low noise mode operation, reselecting the plant item and/or with an acoustic enclosure.

11.5 Assessment Summary

Our assessment, details of which are provided in Appendix B, is summarised in the following table:

Operation	Rating Level	Excess of Rating Level over Background Sound Level	Impact
Condenser unit	41 dBA	-5 dBA	Low

Our assessment indicates that upon implementation of suitable noise mitigation measures (see Section 11.4) noise from the proposed condenser unit is predicted to have a low impact upon the potentially worst affected noise sensitive windows, which we understand to be located to the east of the courtyard.

12.0 Conclusions

It is proposed to undertake a refurbishment of 4-6 Broad Street, Reading. To serve the development, it is proposed to install a new condenser unit within the rear courtyard of the development site.

A detailed environmental noise survey has been undertaken at the site to establish the existing environmental noise levels representative of those experienced at the potentially worst affected noise sensitive window which we understand to be located to the east of the courtyard.

Based on survey results and the requirements of the Local Authority we have assessed noise from the proposed condenser unit in accordance with BS 4142:2014.

Our assessment indicates that without mitigation measures the Local Authority requirements would not be achieved. We have therefore specified acoustic mitigation measures in order that the plant noise emissions from the proposed condenser unit achieve the Local Authority requirements.

Appendix A

The acoustic terms used in this report are defined as follows:

dB	Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).
dBA	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.
L _{90,T}	L ₉₀ is the noise level exceeded for 90% of the period <i>T</i> (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.
L _{eq,T}	L _{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, <i>T</i> .
L _{max}	L _{max} is the maximum sound pressure level recorded over the period stated. L _{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L _{eq} noise level.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

Appendix B – Condenser Unit Noise

Results		Commentary
Manufacturer sound level (hemispherical)	61 dBA	Measured at 1m distance
Attenuation	-15 dBA	See Section 11.4
Background sound level	$L_{A90 (15 \text{ min})} = 46 \text{ dB}$	See Section 8.0
Calculated Distance Attenuation (4m)	- 8 dB	
Façade reflection correction	+3 dB	
Rating level	$(61 - 15 - 8 + 3) \text{ dB} = 41 \text{ dB}$	Calculated by subtracting distance attenuation from specific sound level and adding corrections
Background sound level	$L_{A90 (15 \text{ min})} = 46 \text{ dB}$	
Excess of rating over background sound level	$(41 - 46) \text{ dB} = -5 \text{ dB}$	
Assessment provides an indication of low impact		
Uncertainty of the assessment	Low	The assessment is based on a 'worst-case' of assuming direct view line between the condenser unit and the nearest noise sensitive receptor.

RBS Reading, 4-6 Broad Street, RG1 2BH

Rear Courtyard

L_{eq} , L_{max} and L_{90} Noise Levels

Wednesday 4 December 2019 to Friday 6 December 2019

■ L_{max} ■ L_{eq}

■ L_{90}

