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Noise Impact Assessment...

86 Chalk Farm Road, London. NW1 8AR.

British Standard 4142: 2014 (Amended 2019)

KR06616

version 1.1 – 4th March 2020

Report Conclusion...

The proposed refrigeration and air conditioning equipment installed behind the proposed weather louvre with splitter type inlet and out attenuators will result in noise levels that when assessed in accordance with British Standard 4142: 2014 (amended 2019) will be at least 10 dB below the underlying background noise levels at all times. The proposed noise emissions will comply with Annex 3 of the London Borough of Camden Local Plan.



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Version History...

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1. Executive Summary...

1.1. Introduction

1.1.1 Instruction

KR Associates have been instructed to prepare a noise impact assessment to determine the impact of internally mounted refrigeration and air conditioning equipment associated with the general a1 use of the site at 86 Chalk Farm Road in London on the local residential properties.

1.1.2 Planning Application

Pegasus Group are submitting a planning application to the London Borough of Camden for the *“shop front alterations comprising installation of louvres and fascia panel, together with replacement existing secondary access with glazing, and installation of new secondary access doors.”*

1.1.3 Scope of Assessment

As part of the development it is proposed to locate a new CO₂ gas cooler and pack to provide a refrigeration capacity to the store and a single air conditioning heat pump to provide heating and cooling within an internal plant room. This report will determine the impact of the proposed mechanical equipment on the nearby residents in terms of noise in line with British Standard 4142: 2014 (amended 2019) to show compliance with Policy A4 and Annex 3 of the London Borough of Camden Local Plan.

1.2. Non-Technical Summary of Report

1.2.1 Site Description

It is proposed to install a packaged CO₂ refrigeration pack, CO₂ gas cooler and single air conditioning heat pump internally with attenuators and a weather louvre facing onto Chalk Farm Road. There are residential dwellings above the front of the site at first floor level.

1.2.2 Site Criterion (Section 3)

The Camden Local Plan was fully adopted in 2017 including policy A4 entitled *“Noise and Vibration.”*

Item	Day Time	Night Time	Commentary BS4142: 2014
Residential	-10 dB (No Tones)	-10 dB (No Tones)	Policy A4 Adopted Local Plan Reference to Appendix 3

1.2.3 Specific Levels (Section 4)

The following noise levels are calculated at the nearest noise sensitive property (“NSP1”) using the manufacturers noise levels.

Specific Noise	Day Time	Night Time	Commentary
NSP1	L _{Aeq} , 1 hour 32 dB	L _{Aeq} , 15 minutes 25 dB	Representative level in context of site
Sound Pressure Level (dB) – Reference 2 x 10 ⁻⁵ Nm ⁻²			

1.2.4 Measured Background Noise Levels (Section 5)

External background noise levels were measured at the front of the site between 08:00 on Friday 21st February 2020 and 10:00 on Monday 24th February 2020.

Results	Day Time	Night Time	Commentary
Measured	L _{A90} , 1 hour 45 dB	L _{A90} , 15 min 37 dB	Average measured levels.

1.2.5 Rating Levels (Section 6)

The Rating Noise level is calculated by adding the relevant feature correction to the Specific Noise Level.

Rating Noise	Day Time	Night Time	Commentary
NSP1	L _{Aeq} , 1 hour 32 dB	L _{Aeq} , 15 minutes 27 dB	Representative level in context of site
Sound Pressure Level (dB) – Reference 2 x 10 ⁻⁵ Nm ⁻²			

1.2.6 Uncertainty (Section 7)

The reported expanded uncertainty of the measurements, calculations and other significant factors is +/-2.5 dB assuming a 95% confidence and a convergence equivalent to k = 2.

1.2.7 Compliance with Planning Conditions

The proposed refrigeration and air conditioning equipment installed behind the proposed weather louvre with splitter type inlet and outlet attenuators will result in noise levels that when assessed in accordance with British Standard 4142: 2014 (amended 2019) will be at least 10 dB below the underlying background noise levels at all times. The proposed noise emissions will comply with Annex 3 of the London Borough of Camden Local Plan.

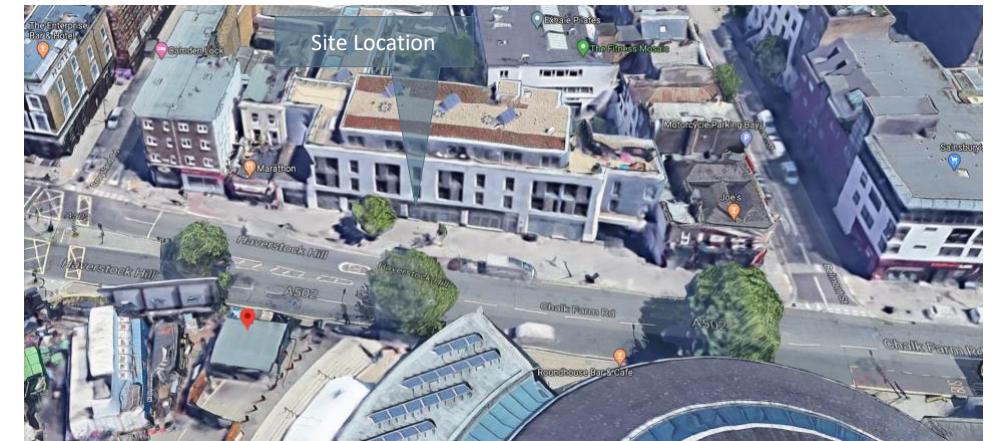
2. Site Description...

2.1. Existing Site Layout

2.1.1 Site Description

The proposed site is located on the north side of Chalk Farm Road to the east of the junction with Crogsland Road.

2.1.2 Existing Site Location Plan

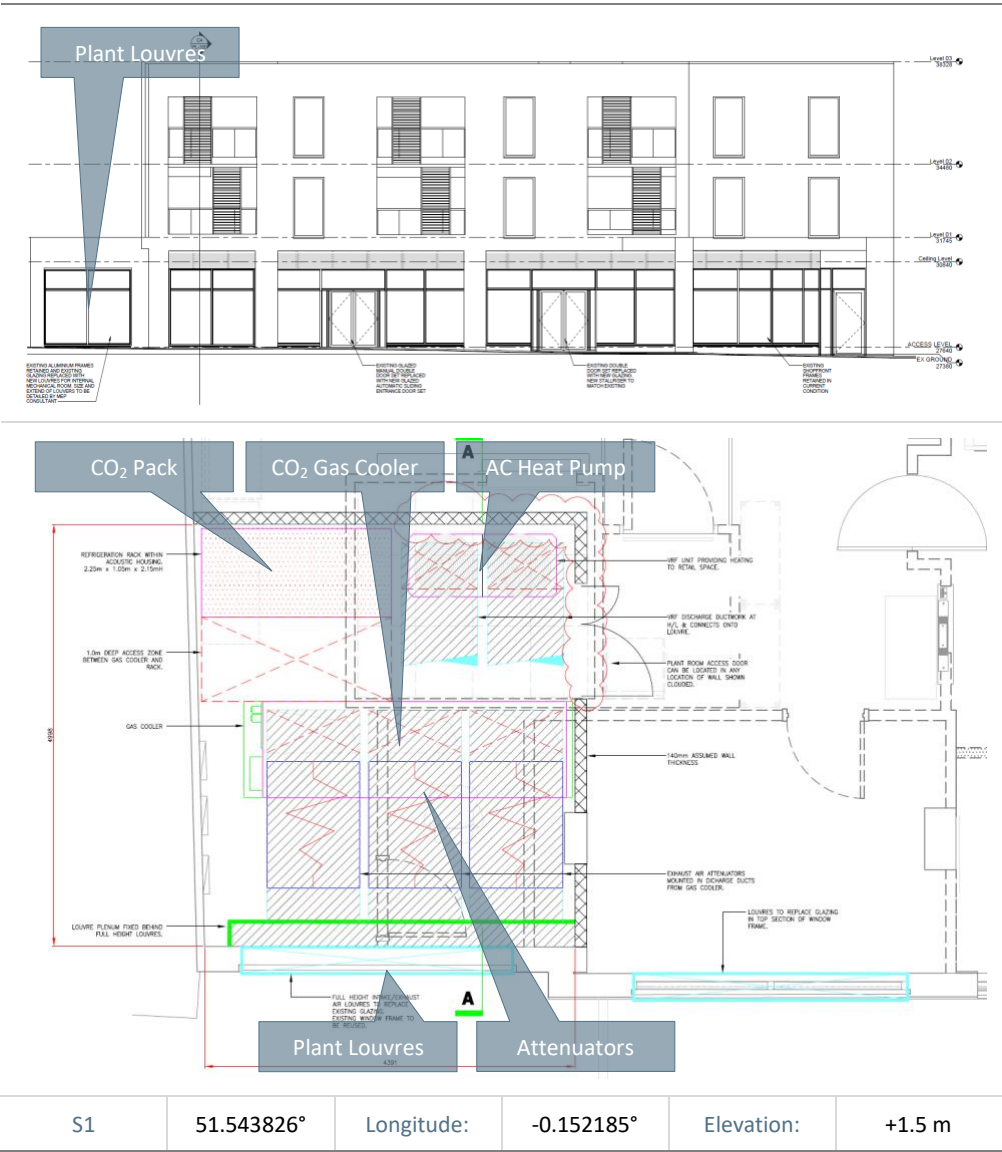


Latitude:	51.543742°	Longitude:	-0.151938°	Elevation:	~7m MAMSL
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2.2. Site Proposal

2.2.1 Location of Mechanical Equipment

It is proposed to locate CO₂ pack and gas cooler and the single air conditioning heat pump within an internal plant room facing Chalk Farm Road.



2.2.2 Nearby Noise Sensitive Properties

The nearest noise sensitive properties are the residential dwellings located above the site at 1st floor level but off-set to the right. There are also residential dwellings to the left at first floor level, but these are slightly further away.



2.3. Survey Preparation (Section 4 – BS4142: 2014)

Before the survey was undertaken consideration was given to the following five areas to fully understand the context of the site to ensure the final assessment of the noise is appropriate and considers the context of the site.

2.3.1 Identification of Sound Source (Section 4a – BS4142: 2014)

The report will only consider the impact of the noise generated 24-hours per day from the following mechanical equipment.

- Packaged CO₂ Refrigeration Pack (operates 24 hours per day)
- 3 Fan CO₂ Gas Cooler (operates 24 hours per day)
- 2 Fan Air Conditioning Heat Pump (operates 07:00 to 23:00 hours only)

2.3.2 Measurement Method and Equipment (Section 4b – BS4142: 2014)

It was considered appropriate to measure background noise levels over a 24-hour period using unattended measurements and a precision noise meter complying with the requirements of BE EN 61672 – Part 1 for free field measurements.

2.3.3 Measurement Location (Section 4c – BS4142: 2014)

The existing site was vacant and the source and assessment position are on the front façade of the building facing Chalk Farm Road and therefore it was considered appropriate to measure the noise levels by fixing a remote noise monitoring station on the front façade of the building above the former entrance door to Evans Cycles.

2.3.4 Measurement Timing and Durations (Section 4d – BS4142: 2014)

It was considered appropriate to measure the existing noise climate over a 24-hour period to establish the underlying background noise levels as some of the mechanical equipment will operate for the entire 24-hour period.

2.3.5 Agent of Change (Section 4e – BS4142: 2014)

The proposal introduces a new noise source to the existing noise environment. This additional is like other A1 uses facing onto Chalk Farm Road. It is therefore considered appropriate to ensure the proposed mechanical equipment does not give rise to noise levels that will result in complaints from the existing residents. As a benchmark the noise levels should comply in full with the relevant policies within the Local Plan.

3. Site Criterion...

3.1. Planning Policy

3.1.1 National Planning Policy Framework 2019

The revised *National Planning Policy Framework* (1) published in 2019 provides an assumption in favour of sustainable development that meets the three overarching objectives: economic, social and environmental. Paragraph 11 provides guidance for decision makers:

“For decision-taking this means:...

c) approving development proposals that accord with an up-to-date development without delay; or

d) ...granting planning permission...

i) the application of policies in this Framework... provides a clear reason for refusing development proposed; or

ii) any adverse impacts of doing so would significantly and demonstrably outweigh the benefits.”

Paragraph 170 of the NPPF provides the following guidance on conserving and enhancing the natural environment in terms of noise:

“Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of ...noise pollution...”

Paragraph 180 of the NPPF requires the development to be appropriate for its location:

“Planning... decisions should also ensure that new development is appropriate for its location...

a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new development and avoid noise giving rise to significant adverse impacts on health and quality of life ⁶⁰

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

⁶⁰ See Explanatory Note to the Noise Policy Statement for England: 2010”

3.1.2 Noise Policy Statement for England: 2010

The *Noise Policy Statement for England* (2) published in 2010 defines three aims:

*“**Avoid** significant adverse impact on health and the quality of life;*

***Mitigate** and minimise adverse impacts on health and quality of life; and*

***Contribute** to the improvement of health and the quality of life.”*

The NPSE defines significant adverse and adverse impact in terms of noise:

*“**NOEL – No Observed Effect Level** – This is the level of noise below which no effect can be detected.*

***LOAEL – Lowest Observed 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.”*

3.1.3 Planning Practice Guidance: 2014

The *Planning Practice Guidance – Noise* (3) (“PPG”) last updated in July 2019 is an online resource published by the Ministry of Housing, Communities and Local Government and provides specific advice on the NPPF and NPSE.

The PPG expands the concept of effect levels and provides a useful table on the link between the effect, perception and typical outcomes.

Effect	Perception	Typical Outcomes
NOEL	Not Noticeable	No effect
	Noticeable & Not Intrusive	Audible, small behaviour change
LOAEL	Noticeable & Intrusive	Audible, behaviour change, quality of life change
SOAEL	Noticeable & Disruptive	Dominant, sleep disturbance
	Noticeable & Very Disruptive	Extensive, harmful impact on health

3.1.4 Night Noise Guidelines: 2009

The aim of the *Night Noise Guidelines* ⁽⁴⁾ published in 2009 was to update the *WHO – Guidelines for Community Noise* ⁽⁵⁾ published in 1999 and provides health-based guidelines for acceptable night time noise levels following the work previously undertaken for the *European Union Directive 2002/49/EC* ⁽⁶⁾ known as the Environmental Noise Directive.

The report goes on to recommend the following thresholds based on the relationship between the night-time noise levels and the effect on the person sleeping.

Effect	Health Effects Observed in the Population	L _{night, outside}
NOEL	Up to this level no biological effects are observed	30 dB
LOAEL	Effects on sleep, body movements, awakening	40 dB
SOAEL	Significant adverse health effects	> 55 dB

3.2. British Standard 4142: 2014...

3.2.1 General Scope of Standard

British Standard 4142: 2014 provides a method for assessing the likely effects of sound from industrial or commercial nature on “people who might be inside or outside a dwelling used for residential purposes”.

“This British Standard describes the methods for rating and assessing sound of a.... commercial nature, which includes:

b) sound from fixed installations which comprise mechanical and electrical plant and equipment.”

The standard may be used to establish the following:

“This standard is applicable to the determination of the following levels at outdoor locations:

*a) rating levels for sources of sound of a commercial nature;
b) ambient, background and residual noise levels.*

For the purposes of:

2) assessing sound from proposed, ... new....source(s) of sound of a Commercial nature.”

3.3. Local Plan

3.3.1 Local Policies

The Camden Local Plan was fully adopted in 2017 including policy A4 entitled “Noise and Vibration.”

“The Council will seek to ensure that noise and vibration is controlled and managed.

Development should have regard to Camden’s Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:

development likely to generate unacceptable noise and vibration impacts; or development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.”

3.3.2 Appendix 3 of Local Plan

Appendix 3 of the Local Plan Advises:

“Industrial and Commercial Noise Sources

A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ (BS 4142) will be used. For such cases a ‘Rating Level’ of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion). ”

3.3.3 Criterion

In order to comply with Policy A4 of adopted Local plan of the London Borough of Camden it is recommended that the proposed plant is designed to result in a -10 dB assessment under British Standard 4142: 2014 (a 2019).

3.4. Test Procedure (Section 6 – BS4142: 2014)

3.4.1 Field Calibration Check

The field calibration check before and after the measurements indicated an overall calibration drift of less than 0.1 dB(A) for the entire measurement system and was considered appropriate and reasonable for unattended measurements. The measurement chain was valid and a reasonable reliance can be placed on the results but with consideration within the uncertainty calculations from the original laboratory calibration and recorded drift between calibrations.

Period	Calibrator Level		Meter Reading	
	Broadband	1000 Hz	Broadband	1000 Hz
Before	94.1 dB	94.1 dB	94.1 dB	94.1 dB
After	94.1 dB	94.1 dB	94.1 dB	94.1 dB

3.4.2 Measurement Location Selection

Section 6.2 of British Standard 4142: 2014 recommends that where practical background noise measurements are undertaken at a height of between 1.2m and 1.5m above ground level and at least 3.5m from any reflective surface other than the ground. Where this is not possible the following corrections have been applied to the background noise levels.

Correction	Correction – Section 6.2 of British Standard 4142: 2014	Applied
-3 dB	Measurement 1m from façade – Far Field Sources	-0 dB
-1 to -2 dB	Measurement 1m from façade – Near Field Sources	-0 dB

3.4.3 Precautions Against Interference

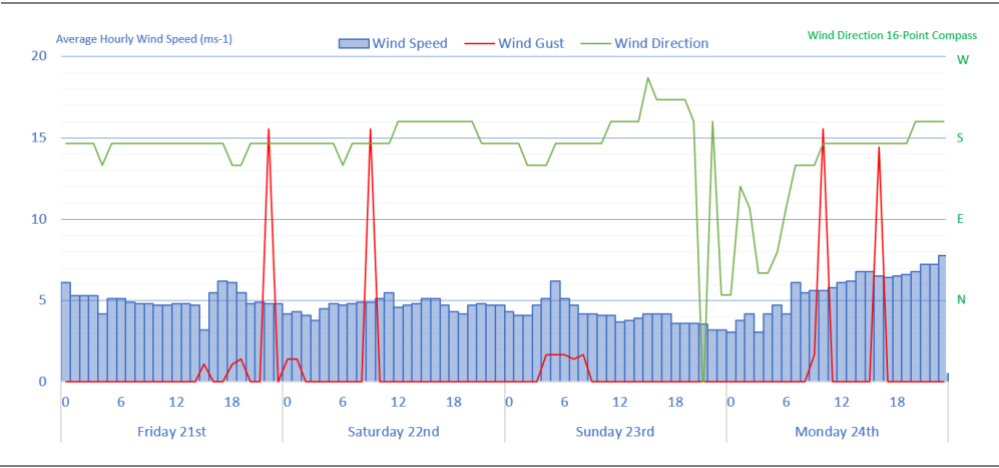
The weather conditions were established during the measurement period and it was concluded that the following did not interfere with the background measurements:

- a) Wind passing over the microphone inducing vibration in the diaphragm.
- b) Rain falling on the microphone windshield or nearby surfaces.
- c) Electrical or electromagnetic interference.
- d) Variation in temperature outside the calibrated range of the meter.

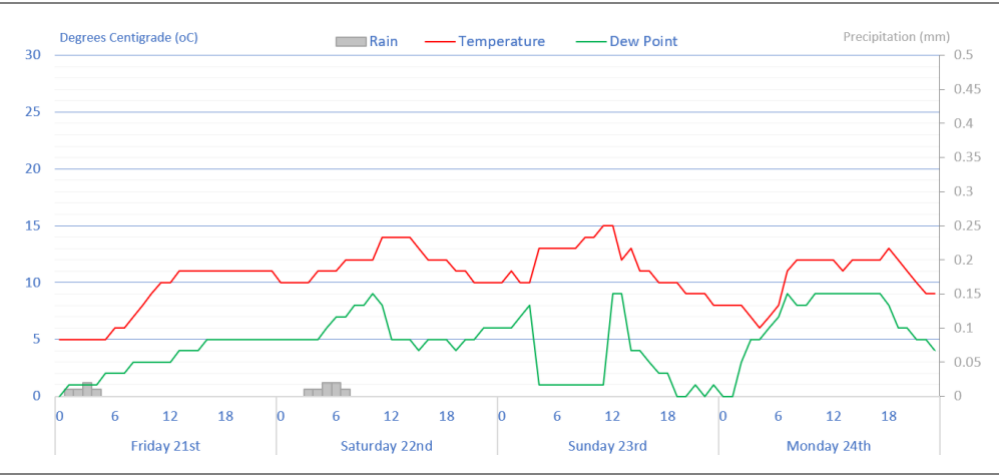
3.4.4 Weather Conditions

The following data is taken from the Weather Underground site using a website API at the nearby 24-hour weather station.

3.4.5 Wind Speed and Direction



3.4.6 Temperature, Dew Point and Rainfall



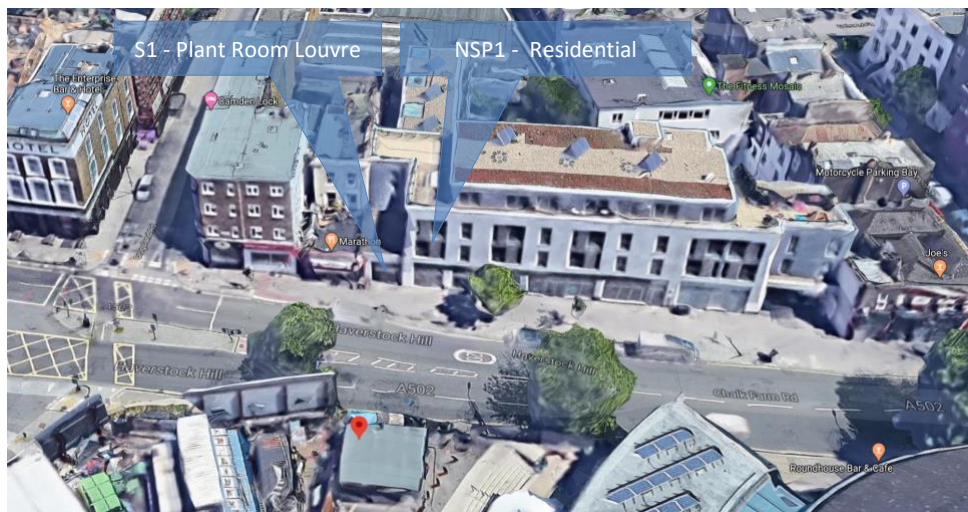
3.4.7 Impact of Weather

The weather did not impact the measurements of the background noise levels.

4. Specific Sound (Section 7 – BS4142: 2014)...

4.1. Location of Sources and Noise Sensitive Properties

4.1.1 Location Plan



Ref	Description of Source	Latitude	Longitude	Altitude
S1	Plant Room Louvre on Front Facade	51.543826°	-0.152185°	+1.5m
NSP1	Residential Dwelling	51.543805°	-0.152127°	+6 m

4.1.2 Relative Distances

The following table shows the relative distance between the centre of the plant room louvre at ground floor level and the 1st floor residential window. The distances are taken from the centre of the louvre and the centre of the window.

Ref	Source	Ref	Receiver	Distance
S1	Internal Plant Room	NSP1	Residential	8 m

It should be noted that NSP1 is actually 1m from the façade line of the building in front of the recessed balcony area.

4.2. Internal Noise Levels

4.2.1 Source GC1 – 3 Fan Gas Cooler

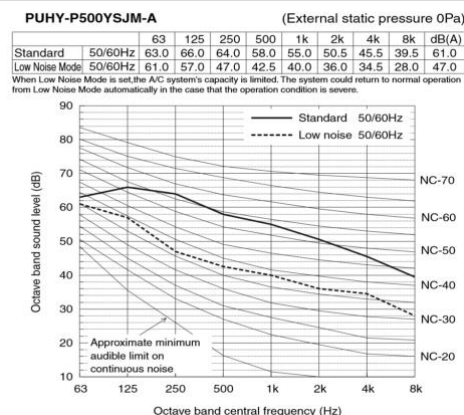
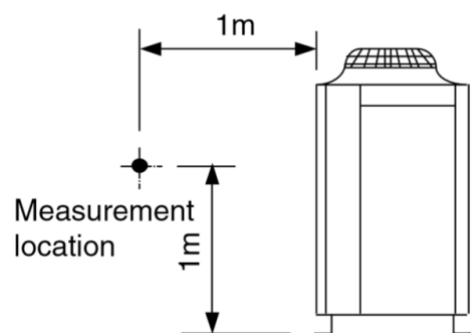
Manufacturer	Kelvion	Standard	BS EN ISO 3744: 2010						
Model	GE A103 G4 3 Fan	Data Metrics	Sound Pressure Levels at 10m						
Operation	Continuous operation against Total Heat Rejection (THR) at 35°C Ambient								
Uncertainty	Octave Band Frequency (Hz)	(A)	63	125	250	500	1K	2K	4K
	Engineering (Grade 2)	1.5	3.0	3.0	2.0	2.0	1.5	1.5	1.5
Unit Dimensions	2,957mm long x 957mm wide x 972mm high nominal								
Manufacturers Data	Octave Band Frequency (Hz)	(A)	63	125	250	500	1K	2K	4K
	Left Hand Side	57	55	57	57	54	51	49	49
Sound Pressure Level @ 1m from the sides of the AC unit – $L_{Aeq, 5 minutes}$ (dB) Ref $2 \times 10^{-5} \text{ Nm}^{-2}$									

4.2.2 Source PA1 – CO₂ Compressor Pack (Housed)

Manufacturer	Clade CE Universal	Standard			BS EN ISO 3744: 2010				
Model	Mt1 CO ₂ Pack	Data Metrics			Sound Pressure Levels at 10m				
Operation	Continuous operation against Total Heat Rejection (THR) at 35°C Ambient								
Uncertainty	Octave Band Frequency (Hz)	(A)	63	125	250	500	1K	2K	4K
	Engineering (Grade 2)	1.5	3.0	3.0	2.0	2.0	1.5	1.5	1.5
Unit Dimensions	2,957mm long x 957mm wide x 972mm high nominal								
Manufacturers Data	Octave Band Frequency (Hz)	(A)	63	125	250	500	1K	2K	4K
	Left Hand Side	45	48	82	49	46	45	45	42
Sound Pressure Level @ 1m from the sides of the AC unit – $L_{Aeq, 5 \text{ minutes}}$ (dB) Ref $2 \times 10^{-5} \text{ Nm}^{-2}$									

4.2.3 Source AC1 – Air Conditioning Heat Pump

Manufacturer	Mitsubishi Electric	Standard			BS EN ISO 3744: 2010				
Model	PUHY – P500	Data Metrics			Sound Pressure Levels at 1m				
Operation	Continuous operation against Total Heat Rejection (THR) at 35°C Ambient								
Uncertainty	Octave Band Frequency (Hz)	(A)	63	125	250	500	1K	2K	4K
	Engineering (Grade 2)	1.5	3.0	3.0	2.0	2.0	1.5	1.5	1.5
Unit Dimensions	920mm long x 760mm wide x 1,710mm high nominal								



Manufacturers Data	Octave Band Frequency (Hz)	(A)	63	125	250	500	1K	2K	4K
	Front of Unit	61	63	66	64	58	55	51	46

Sound Pressure Level @ 1m from the sides of the AC unit – $L_{Aeq, 5 \text{ minutes}}$ (dB) Ref $2 \times 10^{-5} \text{ Nm}^{-2}$

4.2.4 Attenuators

The following attenuators will be installed behind the external louvres:

Manufacturers Data	Octave Band Frequency (Hz)	R _w	63	125	250	500	1K	2K	4K
	1,200mm Splitter Attenuator	--	8	11	21	34	37	33	24

Transmission Loss

4.2.5 End Reflection Loss

The following correction is applied to account for the change in reverberant field within the attenuator to the external diffuse field which is often referred to as the end reflection loss.

End Reflection Loss Correction	Octave Band Frequency (Hz)	R _w	63	125	250	500	1K	2K	4K
	1,200mm Splitter Attenuator	10	5	3	1	0	0	0	0

Transmission Loss

4.2.6 Calculations of Noise Levels – Externally.

The following provides details of the calculations to establish the external noise levels 1m from the louvre within the day-time and night-time periods.

Measurement Location	Broadband	Octave Centre Band Frequency (Hz)						
	(A)	63	125	250	500	1K	2K	4K
GC1 – CO ₂ Gas Cooler (L _w)	65	63	65	65	62	59	57	57
PA1 – CO ₂ Pack (L _w)	59	56	60	57	54	53	53	51
AC1 – AC Heat Pump (L _w)	69	71	74	72	66	63	59	54
Combined Internal (L _w)	71	72	75	73	68	65	62	59
1,200mm Attenuator	--	8	11	21	34	37	33	24
End Reflection Loss	--	8	8	7	6	6	6	6
Day Time External (L _w)	55	67	69	58	40	34	35	41
Night Time External (L _w)	48	59	60	51	35	29	31	40

L_w – Sound Power Level – Reference 1×10^{-12} watts (dB)

For reference it is assumed day-time will be between 07:00 and 23:00 hours and night-time will be between 23:00 and 07:00 hours.

4.3. External Calculation Methodology

4.3.1 Scope of Methodology

The International Standards Organisation (“ISO”) published ISO 9613 – Part 2: 1996 entitled “Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculations” details the method for calculating the noise levels at a specific position. It was considered appropriate within the context of the site to use this calculation method to determine the sound pressure level at noise sensitive position from the supplied manufacturers data.

4.3.2 Source Directivity (D_c)

A correction is made to account for the location of the individual sources and the effect of reflective surfaces excluding the ground and is contained within section 6 of ISO 9613 - Part 2:1996.

Number of Surfaces	Correction in dB (D_c)
1 Reflective Surface	+3 dB
2 Reflective Surfaces	+6 dB
3 Reflective Surfaces	+9 dB

4.3.3 Geometric Divergence (A_{div})

A correction is made for the distance between the source and assessment position using the following formula defined in section 7.1 of ISO 9613-Part 2:1996.

Formula	Symbols
$A_{div} = 20 \cdot \log_{10} (d/d_0) + 11$	A_{div} = Reduction due to Geometric Divergence (dB) d = Distance from source to receiver (m) d_0 = reference distance (1m)

4.3.4 Atmospheric Absorption (A_{atm})

As the source was less than 100m from the receiver position (assessment position) no correction was made for atmospheric absorption.

4.3.5 Ground Absorption (A_{gr})

A correction is made for the effect of the ground between the source and receiver depending on whether it is considered hard or soft ground.

Type of ground	Correction in dB (A_{gr})
Hard Ground	+ 3 dB
Soft Ground	+ 0 dB

4.3.6 Barrier Effect (A_{bar})

A correction is made for any barrier in the direct line of site between the source and the assessment position and is detailed in section 7.4 of ISO 9613-Part 2:1996. For clarity the K_{met} meteorological correction has been ignored and C_2 equals 40 and C_3 equals 1.

Formula	Symbols
$A_{bar} = 10 \cdot \log_{10} [3 + (40 \cdot \delta / \lambda) - A_g]$ *Note 1 where $\delta = a + b - r$ and $\lambda = c / f$	A_{bar} = Effective barrier attenuation (dB) A_{gr} = Total Ground Absorption (dB) *Note 1: Only apply the A_{gr} correction if $A_{gr} > 0$ δ = Path difference (m) a = Distance from source to barrier head (m) b = Distance from barrier head to assessment position (m) r = Distance from source to assessment position (m) λ = Wavelength of sound (m) c = Speed of sound – Assumed to be 342 ms ⁻¹ f = Octave band centre frequency (Hz)

4.3.7 A-Weighted and Octave Band Data

It should be noted that the calculations have been undertaken in octave bands. The corrections for source directivity (D_c), geometric divergence (A_{div}) and ground absorption (A_{gr}) are not frequency dependent and therefore the same correction is applied to all octave bands.

However, the correction for barrier effect (A_{bar}) is frequency dependent and therefore the correction is different at each octave band. The calculations are undertaken in each octave band with the overall impact for barrier attenuation to the A-weighted level report in the summary calculations. Details of the barrier correction are provided in section 4.4 onwards to demonstrate the correct barrier attenuation has been applied to the calculations.

4.4. Specific Noise Levels at Noise Sensitive Position 1 (NSP1)

4.4.1 Calculation Corrections

NSP1		D _c	A _{div}	A _{gr}	A _{bar} – Octave Band Centre Frequency (Hz)							
Ref	r				δ	63	125	250	500	1K	2K	4K
SP1	8	+3	-29	+3	0.00	0	0	0	0	0	0	0
Corrections												

4.4.2 Day-Time - Resultant Noise Levels

The following are the specific noise levels at NSP1 in the day-time (35°C Ambient).

Ref	Receiver Position	L _{p(1m facade)} – Octave Band Centre Frequency (Hz)							
		A	63	125	250	500	1K	2K	4K
NSP1	Residential Dwellings	32	44	46	35	17	11	12	18
1m from NSP1 Façade - Sound Pressure Levels (dB) Reference 2 x 10 ⁻⁵ Nm ⁻²									

4.4.3 Night-Time - Resultant Noise Levels

The following are the specific noise levels at NSP1 in the night-time (25°C Ambient).

Ref	Receiver Position	L _{p(1m facade)} – Octave Band Centre Frequency (Hz)							
		A	63	125	250	500	1K	2K	4K
NSP1	Residential Dwellings	25	36	37	28	12	6	8	17
1m from NSP1 Façade - Sound Pressure Levels (dB) Reference 2 x 10 ⁻⁵ Nm ⁻²									

4.4.4 Specific Noise Levels

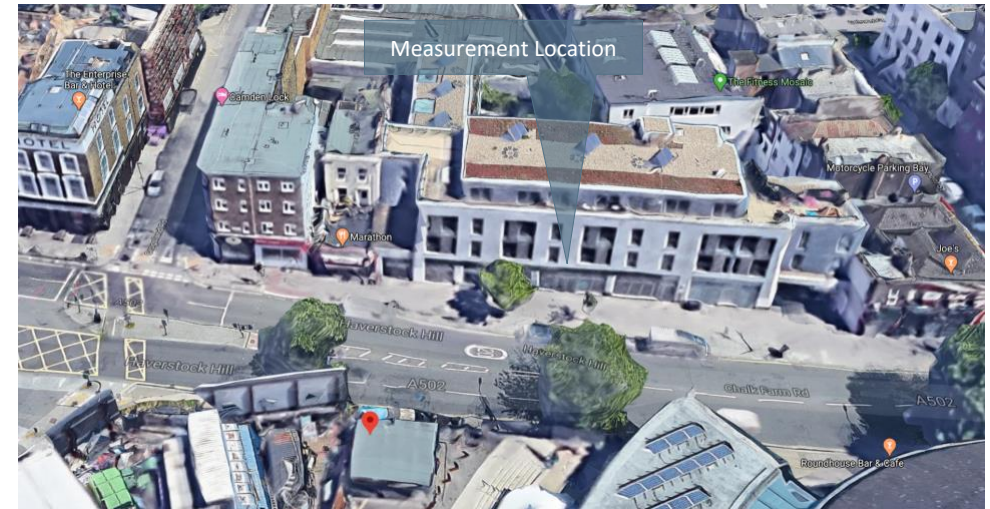
Specific Noise	Day Time	Night Time	Commentary
NSP1	L _{Aeq, 1 hour} 32 dB	L _{Aeq, 15 minutes} 25 dB	Representative level in context of site
Sound Pressure Level (dB) – Reference 2 x 10 ⁻⁵ Nm ⁻²			

5. Background Noise Levels...

5.1. Instrument Details (Section 5 – BS4142: 2014)

5.2. Measurement Location

External background noise levels were measured at the front of the site between 08:00 on Friday 21st February 2020 to 10:00 on Monday 24th February 2020.



Latitude:	51.543747°	Longitude:	-0.151951°	Elevation:	3.5 m
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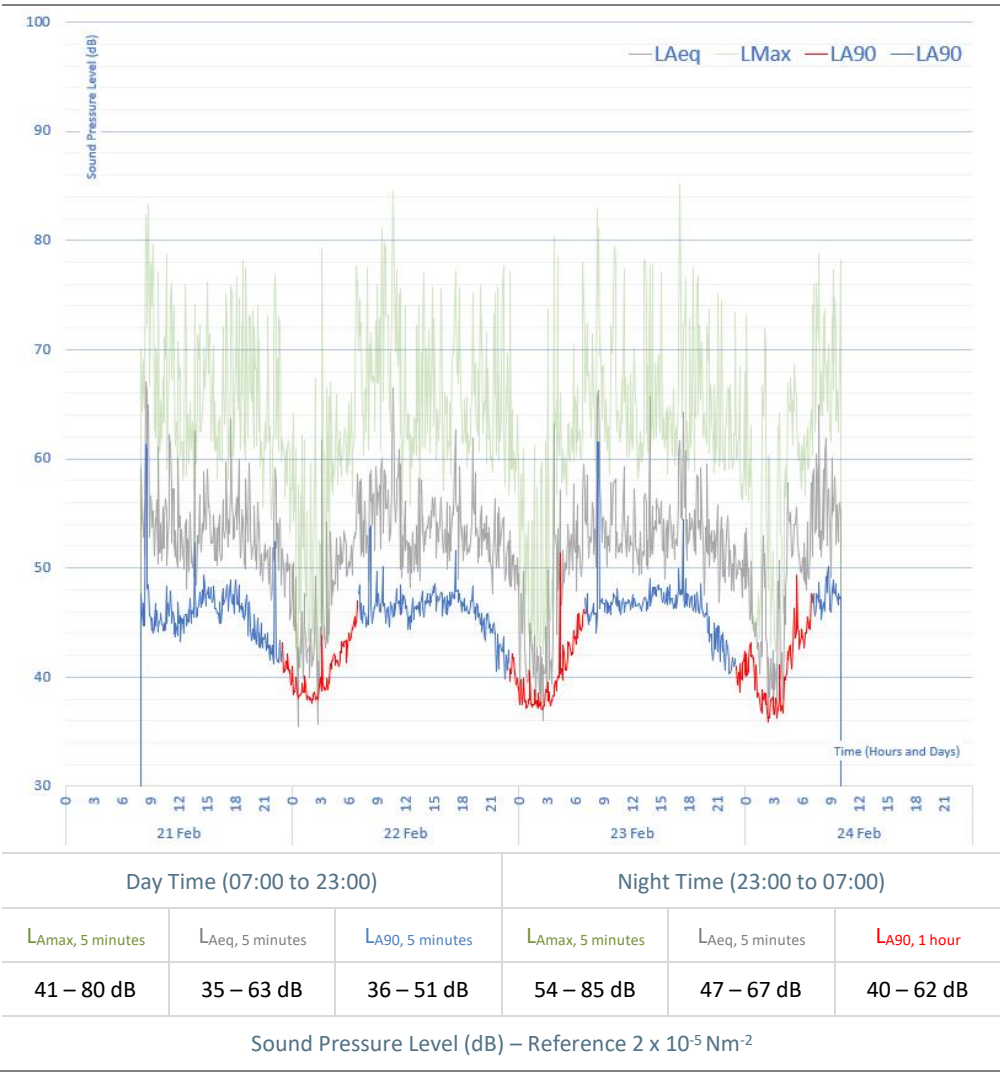
5.2.1 Calibration Details of Equipment

The following equipment was used to measure the background noise levels which were verified on site before and after the measurements using the associated calibrator.

Type	Sound Level Meter	Microphone	Calibrator
	633.C1	251	120/1
Manufacturer	Casella	Casella	Casella
Serial Number	2145360	00709	5231002
Certificate Number	U30498	U30497	U30496
Calibration Date	4 th January 2019	4 th January 2019	7 th January 2020

5.3. Measurements Results (Section 8 – BS4142: 2014)

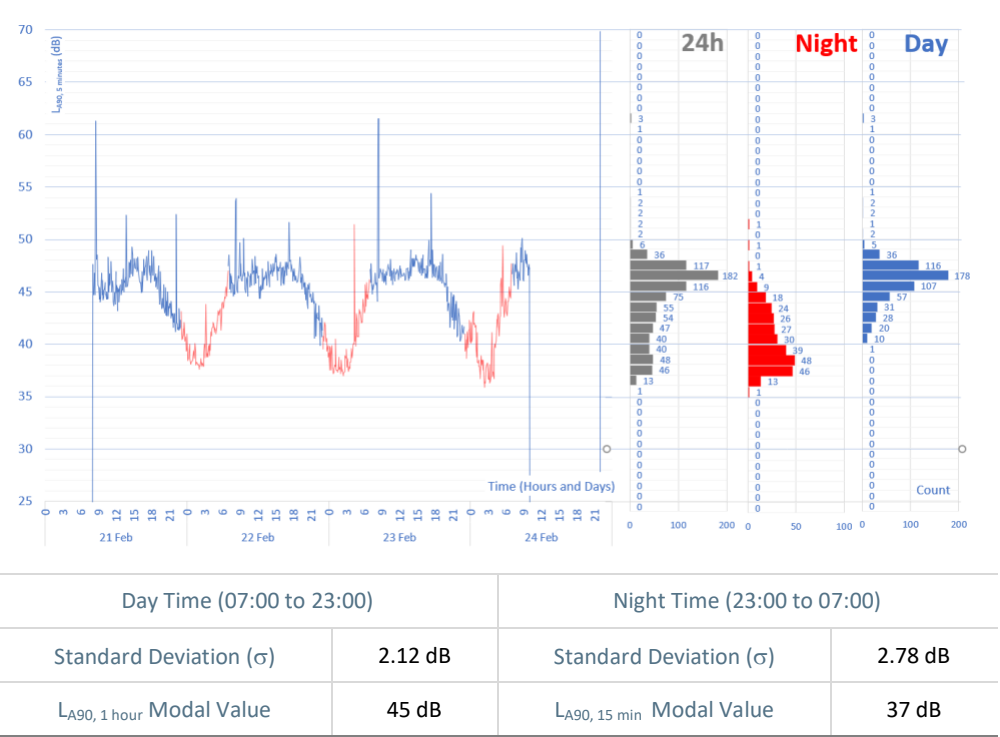
The following table shows the underlying background noise levels which are dominated by the noise from Chalk Farm Road.



Green Trace: L_{Max}, 5 minutes 24-hours per day
Grey Trace: L_{Aeq}, 5 minutes 24 hours per day
Blue Trace: L_{A90}, 5 minutes 07:00 to 23:00 (Day-time)
Red Trace: L_{A90}, 5 minutes 23:00 to 07:00 (Night-time)

5.3.1 Modal Analysis of Background Data

The L_{A90} data sets were taken and the modal analysis done using a standard bandwidth of 1 dB to establish the modal noise level.



5.3.2 Context of Site

Using the guidance within British Standard 8233:2014 the following table indicates the adjustments for the context from external factors.

Results	Day Time	Night Time	Commentary
Measured	L _{A90} , 1 hour 45 dB	L _{A90} , 15 min 37 dB	Average measured levels
Climate	0 dB	0 dB	Possible influence of prevailing wind
Position	0 dB	0 dB	No correction for the position
Time of Year	+0 dB	+0 dB	Recorded unsettled weather
Background	L _{A90} , 1 hour 45 dB	L _{A90} , 15 min 37 dB	Representative level in context of site

6. Rating Levels...

6.1. Feature Correction (Section 8 – BS4142: 2014)

6.1.1 Scope of Standard Corrections

British Standard 4142: 2014 provides in section 9.1 details of three methods for determining the feature corrections that should be applied to the specific noise to obtain the rating noise level.

“Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present in the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways.

- a) Subjective method;*
- b) Objective method for tonality;*
- c) Reference method.”*

6.1.2 Subjective Method

British Standard 4142: 2014 provides the following guidance on the use of the subjective method in section 9.2.

“Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.”

The standard provides the following commentary on the subjective assessment of tonality, impulsivity, character and intermittency.

Feature Correction	Perceptibility of specific noise at assessment position against residual noise			
	Not	Just	Clearly	Highly
Tonality	+0 dB	+2 dB	+4 dB	+6 dB
Impulsivity	+0 dB	+3 dB	+6 dB	+ dB
Character	+0 dB	+3 dB		
Intermittency	+0 dB	+3 dB		

6.1.3 Objective Method

British Standard 4142: 2014 provides the following guidance on the use of the objective method in section 9.3.

“If the subjective method is not sufficient for assessing the audibility of tones in sound ...use the one-third octave method...”

Identify tones using the method given in Annex C, then add a correction of 6 dB if a tone is present”

Annex C entitled “Objective method of assessing the audibility of tones in sound: One-third octave method” provides details of how to establish if a discrete-frequency spectral component or tone is present in the one-third octave linear data.

Feature Correction	1/3 rd Octave Bands – Difference between Adjacent Bands		
	25 – 125 Hz	160 – 400 Hz	500 – 10,000 Hz
Tonality	15 dB difference	8 dB difference	5 dB difference

6.1.4 Reference Method

British Standard 4142: 2014 provides the following guidance on the use of the reference method in section 9.3.3.

“If the subjective method is not sufficient for assessing the audibility of tones in sound or the prominence of impulsive sounds ...use the reference methods ...

Audibility of tone given in Annex D, which produces a penalty on a sliding scale from 0.0 to 6.0 dB. Prominence of impulsive sounds, which produces penalties in the range 0.0 dB to 9.0 dB.”

6.1.5 Selection of Appropriate Method

As the equipment has not yet been installed and reliance must be placed on the sound power levels provided by the manufacturers third-octave data, FFT analysis or short time based noise levels have not been provided and therefore it is considered appropriate to use the subjective method to determine the feature correction applied to the Rating Level. However, it should be noted that account is taken for this in the uncertainty calculations.

6.1.6 Comparison to Existing Noise Levels

British Standard 4142: 2014 refers to the feature correction in section 9.1.

“Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level.”

It was considered appropriate to quantify the likely perceptibility of the specific noise at the assessment by comparing the calculated specific noise level against the minimum $L_{Aeq,t}$ value.

Feature Correction	Perceptibility of specific noise at assessment position against residual noise			
	Not	Just	Clearly	Highly
Difference	Less than -10	-20 to -16	-15 to -11	-10 or more

6.2. Rating Level (Section 9 – BS4142: 2014)

6.2.1 Feature Correction

Source	Feature Correction									
	Tonality		Impulsivity		Character		Intermittency		TOTAL	
Time Period	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
NSP1	+0dB	+2dB	+0dB	+0dB	+0dB	+0dB	+0dB	+0dB	+0dB	+2dB

6.2.2 Rating Levels

The following table indicates the Rating Noise Levels

Rating Noise	Day Time	Night Time	Commentary
NSP1	$L_{Aeq, 1 \text{ hour}}$ 32 dB	$L_{Aeq, 15 \text{ minutes}}$ 27 dB	Representative level in context of site
Sound Pressure Level (dB) – Reference $2 \times 10^{-5} \text{ Nm}^{-2}$			

7. Uncertainty (Section 10 – BS4142: 2014)...

7.1.1 Scope

Section 10 of British Standard 4142: 2014 entitled “Uncertainty” requires the following:

“Consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty. Report the level and potential effects of uncertainty.”

Annex B of British Standard 4142: 2014 entitled “consideration of uncertainty and good practice for reducing uncertainty” makes reference to the University of Salford publication entitled “A Good Practice Guide on the Source and Magnitude of Uncertainty arising in the Practical Measurement of Environmental Noise” edition 1a dated May 2007.

7.1.2 Uncertainty of Measured Values

Ref	Source of Uncertainty Section 10.2 British Standard 4142: 2014	Value dB(A)	Distribution (Divisor)	Uncertainty dB(A)
a	Variability and complexity of sound source	0.50	$\sqrt{2}$	0.35
b	Variability and complexity of residual sound	0.00	$\sqrt{3}$	0.00
c	Residual sound present in specific sound	0.00	$\sqrt{3}$	0.00
d	Background noise position selection	0.10	$\sqrt{3}$	0.06
e	Distance between source and receiver	0.15	$\sqrt{2}$	0.11
f	Number of measurements taken (Days)	0.10	$\sqrt{3}$	0.06
g	Measurement time interval variation	0.00	$\sqrt{2}$	0.00
h	Range of times measurements taken	0.10	$\sqrt{3}$	0.06
i	Suitable weather conditions during measurements	0.20	$\sqrt{3}$	0.12
j	Application of British Standard 4142: 2014	0.10	$\sqrt{2}$	0.07
k	Rounding of each measurement	0.05	$\sqrt{3}$	0.03
l	Instrumentation – Calibration	1.20	$\sqrt{3}$	0.69
Reported Expanded Uncertainty (95% confidence, convergence $k = 2$)				1.61

7.1.3 Uncertainty in Calculations

Ref	Source of Uncertainty Section 10.2 British Standard 4142: 2014	Value dB(A)	Distribution (Divisor)	Uncertainty dB(A)
a	Impact of measured sound level on calculations	0.00	$\sqrt{2}$	0.00
b	Assumption on sound power level of source	0.00	$\sqrt{3}$	0.00
c	Uncertainty of calculation method (ISO 9613)	0.20	$\sqrt{3}$	0.12
d	Model fit against real world conditions	0.10	$\sqrt{3}$	0.06
e	Error in the calculation process	0.15	$\sqrt{2}$	0.11
Reported Expanded Uncertainty (95% confidence, convergence k = 2)				0.33

7.1.4 Uncertainty from Other Factors

Ref	Source of Uncertainty Section 10.2 British Standard 4142: 2014	Value dB(A)	Distribution (Divisor)	Uncertainty dB(A)
a	Standing waves or interference patterns	0.15	$\sqrt{3}$	0.09
b	Approximation of sound source to a point source	0.10	$\sqrt{3}$	0.06
c	Maintenance and repair of source over 15 years	0.50	$\sqrt{3}$	0.29
Reported Expanded Uncertainty (95% confidence, convergence k = 2)				0.61

7.1.5 Combined Reported Expanded Uncertainty

Ref	Source of Uncertainty Section 10.2 British Standard 4142: 2014	Value dB(A)	Distribution (Divisor)	Uncertainty dB(A)
a	Section 7.1.2. Uncertainty of measured values	2.7	$\sqrt{2}$	1.14
b	Section 7.1.3. Uncertainty of calculations	2.7	$\sqrt{2}$	0.23
c	Section 7.1.4. Uncertainty from other factors	2.7	$\sqrt{2}$	0.43
Combined Reported Expanded Uncertainty (95% confidence, convergence k = 2)				2.5

It should be noted that the uncertainty calculations have assumed a Type B uncertainty.

8. Assessment and Conclusions ...

8.1. Initial Estimate of Adverse Impacts (Section 11 – BS4142: 2014)...

8.1.1 Scope of Standard

British Standard 4142: 2014 provides an initial estimate of the adverse impacts, which can include annoyance and sleep disturbance.

“The significance of sound of a.....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.”

The initial estimate of the adverse impact can indicate the following:

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- d) 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.”

8.1.2 Context of the Site

British Standard 4142: 2014 recommends that the context of the site needs to be considered, especially where there are low levels involved.

*“Where the initial estimate of the impacts needs to be modified due to the context, take all pertinent factors into considerations, including the following:
Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.”*

Consideration should also be given to the existing design measures incorporated in more modern residential dwellings including ventilation that negates the need to open windows.

8.1.3 Noise Sensitive Property 1 (NSP1) BS4142 Assessment

Results	Day Time	Night Time	Commentary
Ambient	L _{Aeq} , 1 hour 55 dB	L _{Aeq} , 15 min 50 dB	7.3.1 – Existing levels
Residual	L _{Aeq} , 1 hour 55 dB	L _{Aeq} , 15 min 50 dB	7.3.2 – Source not yet installed
Background	L _{A90} , 1 hour 44 dB	L _{A90} , 15 min 36 dB	8.1.4 – Typical & representative
Specific	L _{Aeq} , 1 hour 32 dB	L _{Aeq} , 15 min 27 dB	7.3.6 – Calculated levels
Feature	+0dB	+2 dB	9.2 - Subjective corrections
Rating	L _{Aeq} , 1 hour 32 dB	L _{Aeq} , 15 min 27 dB	9.2 - Worst case scenario
Background	L _{A90} , 1 hour 45 dB	L _{A90} , 15 min 37 dB	8 - No correction for residual
Assessment	-13 dB	-10 dB	11 - Rating Level – Background Level
Conclusion	Acceptable	Acceptable	11 - Assessment of Impact
Uncertainty	± 2.5 dB		10 – 95% Confidence, k = 2

The British Standard 4142: 2014 (amended 2019) indicates the noise emissions from the generator will be acceptable at the nearest noise sensitive properties.

8.1.4 Compliance with Camden Local Plan

Results	Day Time	Night Time	Commentary
Rating	L _{Aeq} , 1 hour 32 dB	L _{Aeq} , 15 min 27 dB	9.2 - Worst case scenario
Assessment	-13 dB	-10 dB	Rating Level – Background Level
Local Plan	-10 dB	-10 dB	Annex 3 of the Local Plan
Conclusion	Complies	Complies	11 - Assessment of Impact

The assessment indicates that the proposed mechanical equipment installed behind the weather louvre with the splitter type attenuators will meet the requirements of the London Borough of Camden Local Plan.

END OF REPORT

9. Bibliography...

- Ministry of Housing, Communities and Local Government.** *National Planning Policy Framework*. 2019. NPPF.
- Department for Environment, Food and Rural Affairs (DEFRA).** *Noise Policy Statement for England*. 2010. NPSE.
- Ministry of Housing, Communities and Local Government.** *Planning Policy Guidance - Noise*. 2015. PPGN.
- European Union and World Health Organisation.** *Night Noise Guidelines for Europe*. 2009. NNGL.
- World Health Organisation.** *Criteria for Community Noise*. 1999. WHO.
- European Parliament.** *Directive 2002/49/EC Assessment and Management of Environmental Noise*. 2002. 2002/49/EC.
- BSi Standards Publication.** *BS 8233: 2014 Guidance on Sound Insulation and Noise Reduction for Buildings*. 2014. BS 8233.
- Association of Noise Consultants, Institute of Acoustics, Chartered Institute of Environmental Health.** *ProPG: Planning and Noise. Professional Practice Guidance on Planning and Noise. New Residential Development*. 2017. ProPG.
- HM Government.** *The Building Regulations 2010. Ventilation. F1 Means of Ventilation*. 2010 (Amended 2013). ADF.
- Statutory Instrument 2010 No 2214.** *Building and Buildings, England and Wales - The Building Regulations*. 2010. Building Regs.
- Building Performance Centre for Napier University.** *NANR116: Open / Closed Window Research - Sound Insulation through Ventilated Domestic Windows*. 2007. NANR116.
- AECOM for Department Environment, Food and Rural Affairs (DEFRA).** *Possible Options for the Identification of SOAEL and LOAEL in Support of the NPSE*. 2013 (Amended 2013). AECOM.
- BSi Publications.** *BS EN ISO 12354 - Part 3 - Building Acoustics. Estimation of acoustic performance of building from the performance of elements. Airborne sound insulation against outdoor sound*. 2017. BS EN ISO 12354-3.

