KP Acoustics Ltd.
info@kpacoustics.com
1 Galena Road, W6 0LT London, UK
+44 (0) 208 222 8778
www.kpacoustics.com

Phoenix Yard
65 & 67-69 Kings Cross Road
London

Planning Compliance Review
Report 20048.PCR.01 Rev A

Shepheard Epstein Hunter
Phoenix Yard
65 Kings Cross Road
London
WC1X 9LN

Registered in England Company No. 7947892
KP Acoustics is the Trading Name of KP Acoustics Limited

<table>
<tr><th colspan="4">First Issue date: 26/11/2019</th></tr>
<tr><td colspan="4">Revision History
Report 20048.PCR.01</td></tr>
<tr><td>A</td><td>06/01/2020
Report updating with preliminary plant selections and layout</td><td>D</td><td></td></tr>
<tr><td>B</td><td></td><td>E</td><td></td></tr>
<tr><td>C</td><td></td><td>F</td><td></td></tr>
</table>

Written by:	Checked by:	Approved by:
Daniel Green MIOA Senior Acoustic Consultant	**Aidan Tolkien MIOA** Senior Acoustic Consultant	**Kyriakos Papanagiotou MIOA** Managing Director

Contents

List of Attachments

1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Shepheard Epstein Hunter, Phoenix Yard, 65 Kings Cross Road, London, WC1X 9LN, to undertake a noise impact assessment of a proposed plant unit installation serving the building at Phoenix Yard, 65 & 67-69 Kings Cross Road, London.

A 24-hour environmental noise survey has been undertaken on site in order to prepare a noise impact assessment in accordance with BS4142:2014 '*Method for rating and assessing industrial and commercial sound'* as part of the planning requirements of The London Borough of Camden.

This report presents the methodology and results from the environmental survey, followed by calculations in accordance with BS4142 to provide an indication as to the likelihood of the noise emissions from the proposed plant unit installation having an adverse impact on the closest noise sensitive receiver. Mitigation measures will be outlined as appropriate.

2.0 SITE SURVEYS

2.1 Site Description

As shown in Figure 2.1, the site is bounded by Kings Cross Road to the North, and existing residential and commercial properties to all other elevations.

Figure 2.1 Site Location Plan (Image Source: Google Images)

Initial inspection of the site revealed that the background noise profile at the monitoring location was typical of an urban cityscape environment, with the dominant source being road traffic noise from Kings Cross Road, as well as noise from pre-existing plant unit serving neighbouring properties to the rear.

2.2 Environmental Noise Survey Procedure

Continuous automated monitoring was undertaken for the duration of the noise survey between 11:05 on 13/11/2019 and 10:50 on 14/11/2019.

The environmental noise measurement position, proposed plant installation locations, and the closest noise sensitive receiver relative to the plant installations are described within Table 2.1 and shown within Figures 2.2 and 2.3.

Icon	Descriptor	Location Description
	Noise Measurement Position	The microphone was installed on a security railing on a second-floor roof area to the rear of the site, as shown in Figure 2.2
	Closest Noise Sensitive Receiver	The closest noise sensitive receivers to any future plant installation would be the residences to the east, as shown in Figure 2.2
	Proposed Plant Installation Location	Proposed plant would be installed on the roof of the extension to the building

Table 2.1 Measurement position and description

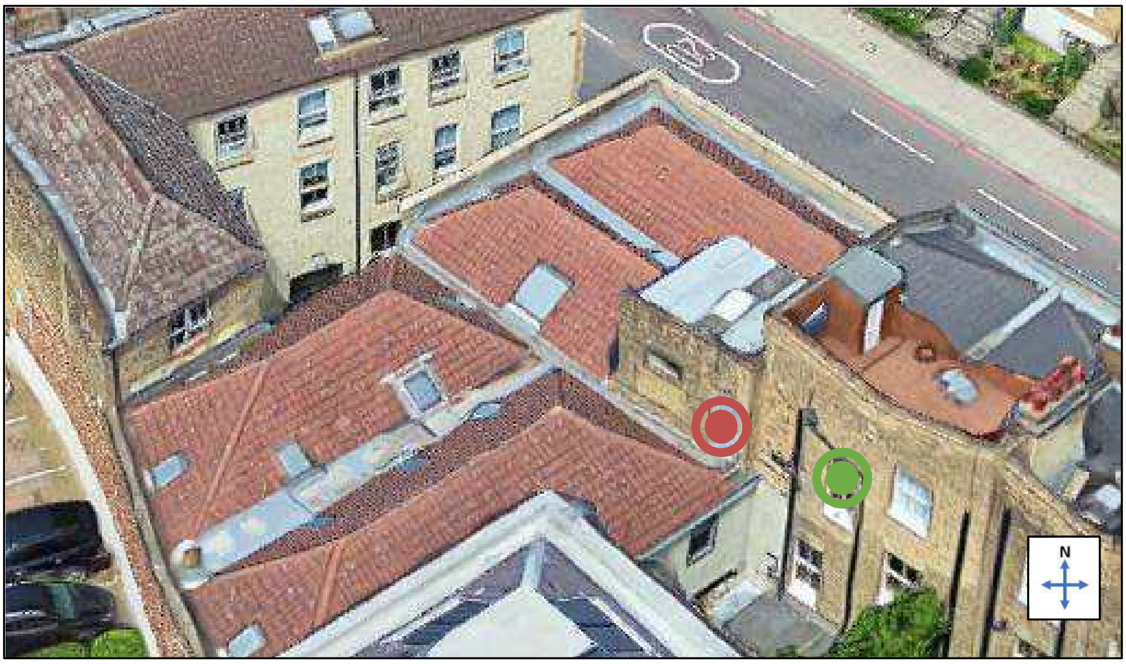


Figure 2.2 Site measurement position, identified receiver (Image Source: Google Images)

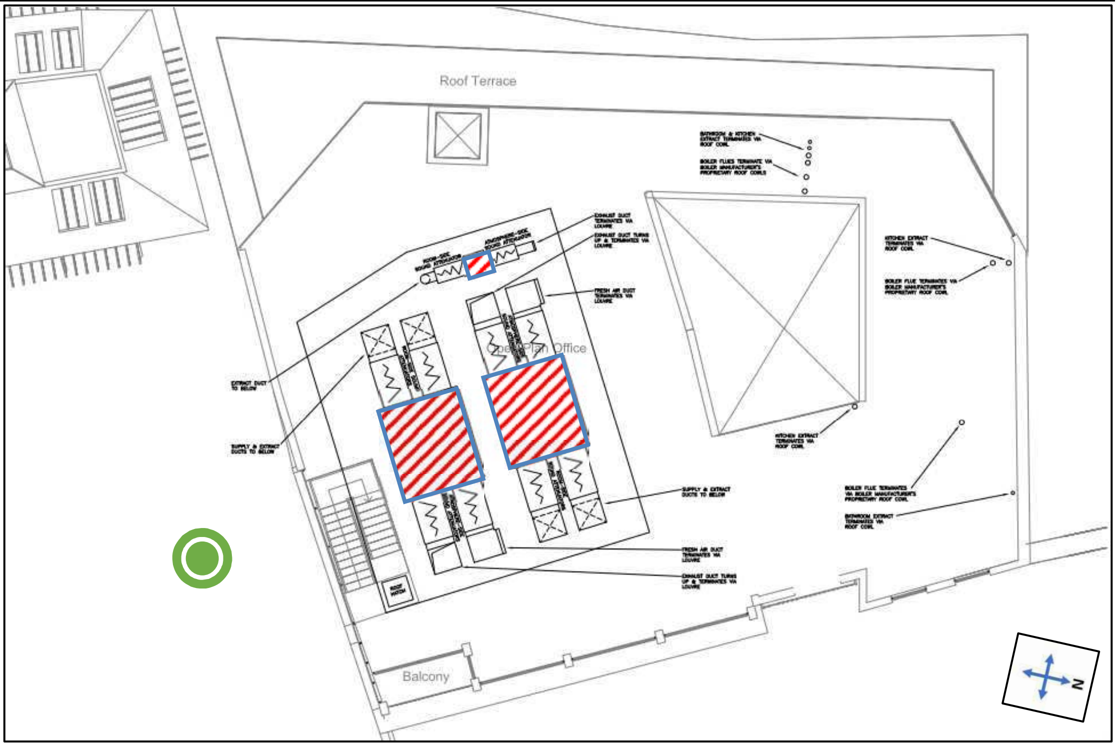


Figure 2.3 Proposed roof plan above new build extension (Image Source: Ingine)

The choice of the monitoring position was based both on accessibility and on collecting representative noise data in relation to the nearest noise sensitive receiver relative to the proposed plant installation.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels*'.

2.3 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.3.

Measurement instrumentation		Serial no.	Date	Cert no.
Kit 5	Svantek Type 958A Class 1 Sound Level Meter	45579	20/08/2018	14010338
	Free-field microphone MTG MK255	11697		
	Preamp Svantek 2v12L	41535		
	Svantek External windshield	-	-	-
B&K Type 4231 Class 1 Calibrator		2147411	04/02/2019	04130/1

Table 2.3 Measurement instrumentation

3.0 RESULTS

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time history in Figure 20048.TH1.

Representative background noise levels are shown in Table 3.1 for daytime and night-time.

It should be noted that the representative background noise level has been derived from the most commonly occurring $L_{A90,5\ min}$ levels measured during the environmental noise survey undertaken on site, as shown in 20048.Daytime.LA90 and 20048.Night-time.LA90 attached.

Time Period	Representative background noise level L_{A90} dB(A)
Daytime (07:00-23:00)	47
Night-time (23:00-07:00)	46

Table 3.1 Representative background noise levels

4.0 NOISE ASSESSMENT GUIDANCE

4.1 BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound'*

British Standard BS4142:2014 '*Methods for rating and assessing industrial and commercial sound*' describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- Sound from industrial and manufacturing processes
- Sound from fixed installations which comprise mechanical and electrical plant and equipment
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

This Standard compares the Rating Level due to the noise source/s under assessment for a one-hour period during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours) with the existing background noise level in terms of an L_{A90} when the noise source is not operating.

It should be noted that the Rating Level is the Specific Sound Level in question ($L_{Aeq,\ Tr}$), including any relevant acoustic feature corrections, as follows:

- **Tonality** – '*For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible*'
- **Impulsivity** – '*A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible*'
- **Intermittency** – '*If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied*'
- **Other sound characteristics** – '*Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied*'

Once the Rating Level has been obtained, the representative background sound level is subtracted from the Rating Level to obtain an initial estimate of the impact, as follows:

- Typically, the greater this difference, the greater the magnitude of the impact
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context
- A difference of around +5 dB could 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 there will be an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context

NOTE: Adverse impacts may include but not be limited to annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

4.2 Local Authority Guidance

The guidance provided by The London Borough of Camden for noise emissions of new plant in this instance is as follows:

The noise criteria, as per the Local Plan 2017 of London Borough of Camden, British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' should be considered as the main reference document for the assessment. The resultant 'Rating Level' would be considered as follows:

Period	Assessment Location	Rating Level Acceptability Range		
		Green: noise is considered to be at an acceptable level	**Amber:** noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development	**Red:** noise is observed to have a significant adverse effect.
Daytime (7:00-23:00)	Garden used for main amenity (free field) and Outside living or dining or Bedroom window (façade)	10dB below background	9 dB below and 5dB above background	5dB above background
Night-time (23:00-7:00)	Outside bedroom window (façade)	10dB below background and no events exceeding 57dB L_{Amax}	9db below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	5dB above background and/or events exceeding 88dB L_{Amax}

Table 4.1 Camden noise criteria for plant and machinery

5.0 NOISE IMPACT ASSESSMENT

5.1 Proposed Plant Installations

It is understood that the proposed plant installation is comprised of the following units:

- 2 No. Nuaire XBC85-H-NES Heat Exchange Units
- 1 No. Helios Gigabox GBW EC 400 B WC Extraction Fan

The proposed installation location for the units will be the roof of the proposed extension, as shown in Figure 2.3 above.

The noise emission levels as provided by the manufacturers for the units are shown in Table 5.1.

Unit	Descriptor	Octave Frequency Band (Hz)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
Nuaire XBC85-H-NES (Intake)	SWL (dB)	78	79	83	82	79	76	71	67	84
Nuaire XBC85-H-NES (Discharge)	SWL (dB)	88	88	89	88	90	85	79	71	93
Nuaire XBC85-H-NES (Breakout)	SWL (dB)	78	70	74	63	57	52	54	52	68
Gigabox GBW EC 400 B (Extract)	SWL (dBA)	56*	56	67	70	71	70	62	55	76
Gigabox GBW EC 400 B (Breakout)	SWL (dBA)	46*	46	54	49	48	46	43	39	57

Table 5.1 Plant Units Noise Emission Levels as provided by the manufacturer

***No data provided by manufacturer. Data replicated from 125Hz**

5.2 Closest Noise Sensitive Receiver

The closest noise sensitive receiver to the proposed installations has been identified as being a residential window of the adjacent residential property to the east, located approximately 4-8 metres from the proposed plant installation locations, as shown in Figure 2.2 and 2.3.

It should be noted the proposed plant unit would be out of line of site of the receiving window due to screening from the building envelope.

5.3 Calculations

The 'Specific Sound Level' of each plant unit installation has been calculated at 1m from the closest receiver using the noise levels shown in Table 5.1, and corrected due to different acoustic propagation features such as distance, reflective surfaces, screening elements, etc. Detailed calculations for each plant unit installation are shown in Appendix B.

The 'Rating Level' of each plant installation have been assessed following the guidelines of BS4142 for the night-time period when the plant could be operational, with a subsequent conclusion taking into consideration the above context. The full BS4142 assessment is presented in Table 5.2.

BS4142 Assessment		
Source:	Plant units installed at roof level	
Operating Period:	Night-time	
Reference time interval (*Tr*):	15 minutes	
Receiver:	Second Floor residential window of property to the east	
Element	**Level (dB)**	**Comment**
Specific Sound Level $L_s = L_{Aeq,\ Tr}$	36	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r. In this case, the specific sound levels take into consideration published noise data from the manufacturers, with appropriate corrections for attenuation due to distance, reflections, and any screening or proposed mitigation
Acoustic Feature Correction	0	As noise from the plant at the receiving window is 10dB below the representative background noise level, it would be anticipated that there would be no acoustic feature noticeable
Rating Level	36	Rating Level = Specific Sound Level + Acoustic Feature Corrections
Representative Background Noise Level $L_{A90,\ T}$	46	Sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, *T*. Derived using the most common occurring levels $L_{A90,\ 5min}$ during the environmental noise survey undertaken on site
Excess of rating over background sound level	-10	
Assessment Indication		
Rating level falls within the 'Green' Rating Level Acceptability Range as outlined in Table 4.1. Noise at this level would be considered to be at an acceptable level, which would be achieved via the mitigation measures outlined in Section 6		

Table 5.2 BS4142 assessment

6.0 NOISE CONTROL MEASURES

In order to achieve the specific sound level and subsequent rating level shown in the assessment above, the following noise control strategy should be adopted.

6.1 Heat Exchange Units

In order to control the noise emissions from the heat exchange units, acoustic silencers should be installed providing the minimum insertion loss values outlined in Table 6.1 below.

Unit	Insertion Loss Levels (dB) in each Octave Frequency Band							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Heat Exchange Unit 1 Air Discharge	6	13	23	37	43	44	35	20
Heat Exchange Unit 1 Air Intake	4	7	13	19	23	23	16	13
Heat Exchange Unit 2 Air Discharge	4	7	13	19	23	23	16	13
Heat Exchange Unit 2 Air Intake	2	4	9	15	17	14	10	8

Table 6.1 Insertion loss figures to be provided by acoustic silencers

In addition to the acoustic silencers, the termination of the intake/exhaust point should be covered with an acoustic louvre, which should provide the minimum insertion loss values outlined in Table 6.2 below

Unit	Insertion Loss Levels (dB) in each Octave Frequency Band							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Heat Exchange Unit 1 Air Discharge	4	3	4	6	11	13	12	10
Heat Exchange Unit 1 Air Intake	4	3	4	6	11	13	12	10
Heat Exchange Unit 2 Air Discharge	4	3	4	6	11	13	12	10
Heat Exchange Unit 2 Air Intake	4	3	4	6	11	13	12	10

Table 6.2 Insertion loss figures to be provided by acoustic louvres

Finally, in order to control noise breakout from the casing of the units, acoustic lagging should be applied around the casing which should provide the minimum insertion loss values outlined in Table 6.3 below.

Unit	Insertion Loss Levels (dB) in each Octave Frequency Band							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Heat Exchange Units 1 and 2 Acoustic Lagging	10	11	12	17	25	25	25	25

Table 6.3 Insertion loss figures to be provided by acoustic lagging to surround unit casing

6.2 WC Extraction Fan

In order to control the noise emissions from the WC extraction fan an acoustic silencer should be installed providing the minimum insertion loss values outlined in Table 6.4 below.

Unit	Insertion Loss Levels (dB) in each Octave Frequency Band							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
WC Extraction Fan Flue Termination	2	4	9	15	17	14	10	8

Table 6.4 Insertion loss figures to be provided by acoustic silencer

6.3 Anti-Vibration Mounting Strategy

In the case of all plant units, appropriate anti-vibration mounts should be installed in order to ensure that vibrations do not give rise to structure-borne noise. Appendix C outlines detailed advice in order to ensure that the system installer selects the appropriate anti-vibration mount for the installation.

It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail.

7.0 CONCLUSION

An environmental noise survey has been undertaken at Phoenix Yard, 65 & 67-69 Kings Cross Road, London, by KP Acoustics Ltd between 11:05 on 13/11/2019 and 10:50 on 14/11/2019. The results of the survey have enabled a representative background noise level to be established.

Manufacturer's noise data of proposed plant units has been used to obtain Specific and Rated Noise Level at the nearest noise sensitive receiver in accordance with British Standard BS4142:2014 for compliance with The London Borough of Camden requirements.

The rating level was compared with the representative background noise level to assess the likelihood of impact considering the environmental noise context of the area as per the requirements of BS4142:2014.

It has been concluded that providing the noise mitigation measures are installed as detailed within this report, noise emissions from the proposed plant units would have a negligible effect on the amenity of nearest residential receivers.

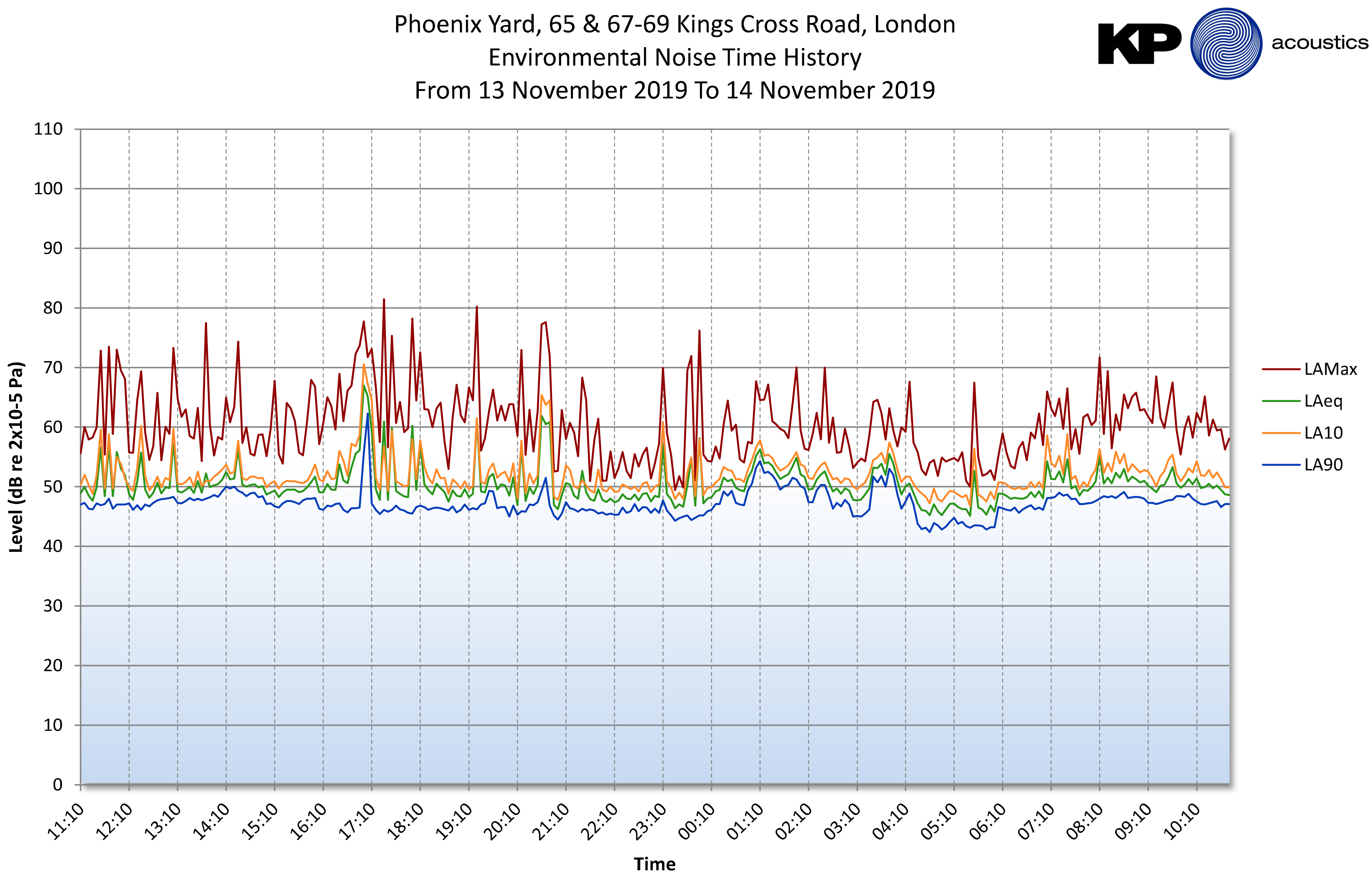


Figure 20048.TH1

Phoenix Yard, 65 & 67-69 Kings Cross Road, London
Representative Daytime Background Noise Level
From 13 November 2019 To 14 November 2019

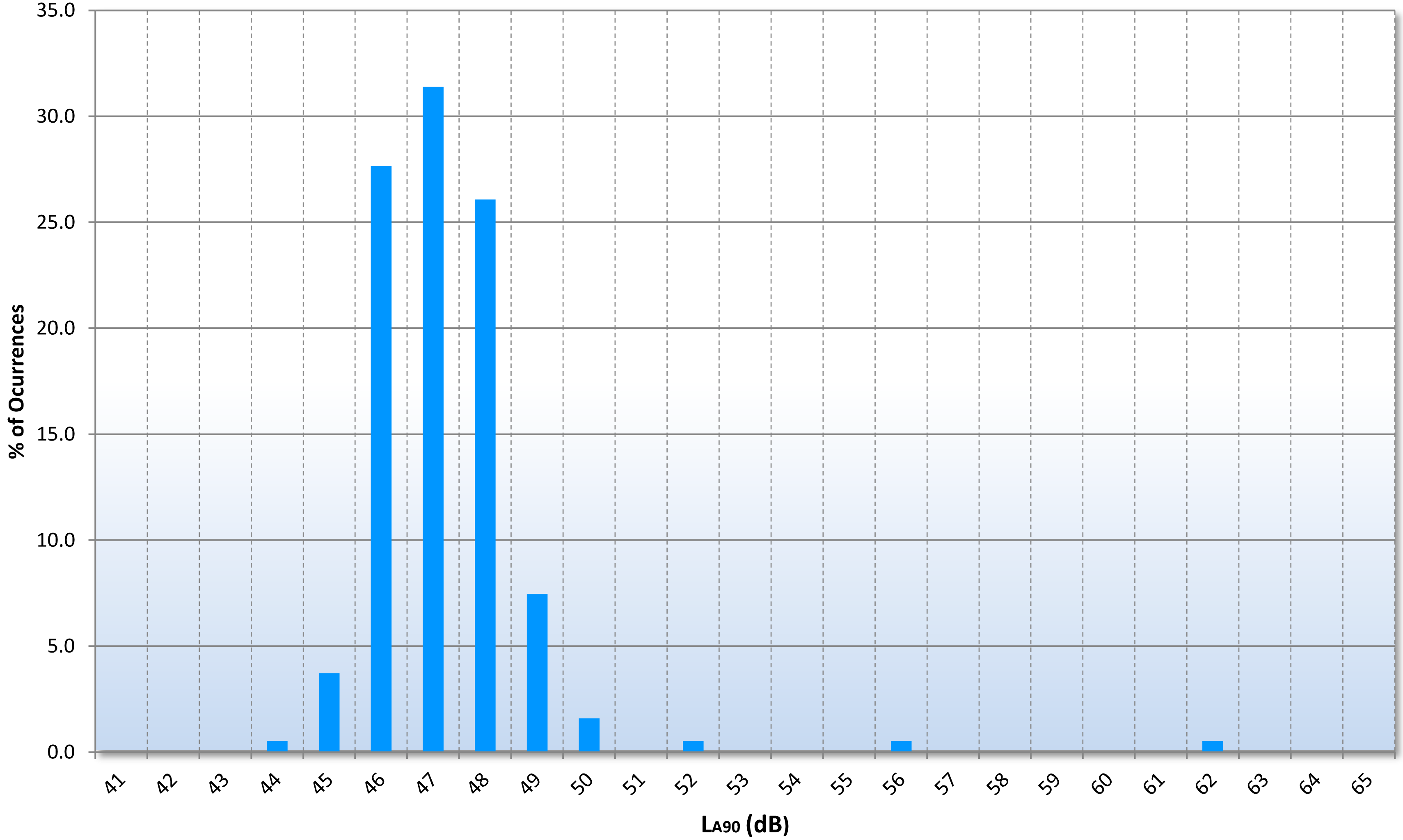


Figure 20048.L90

Phoenix Yard, 65 & 67-69 Kings Cross Road, London
Representative Night-time Background Noise Level
From 13 November 2019 To 14 November 2019

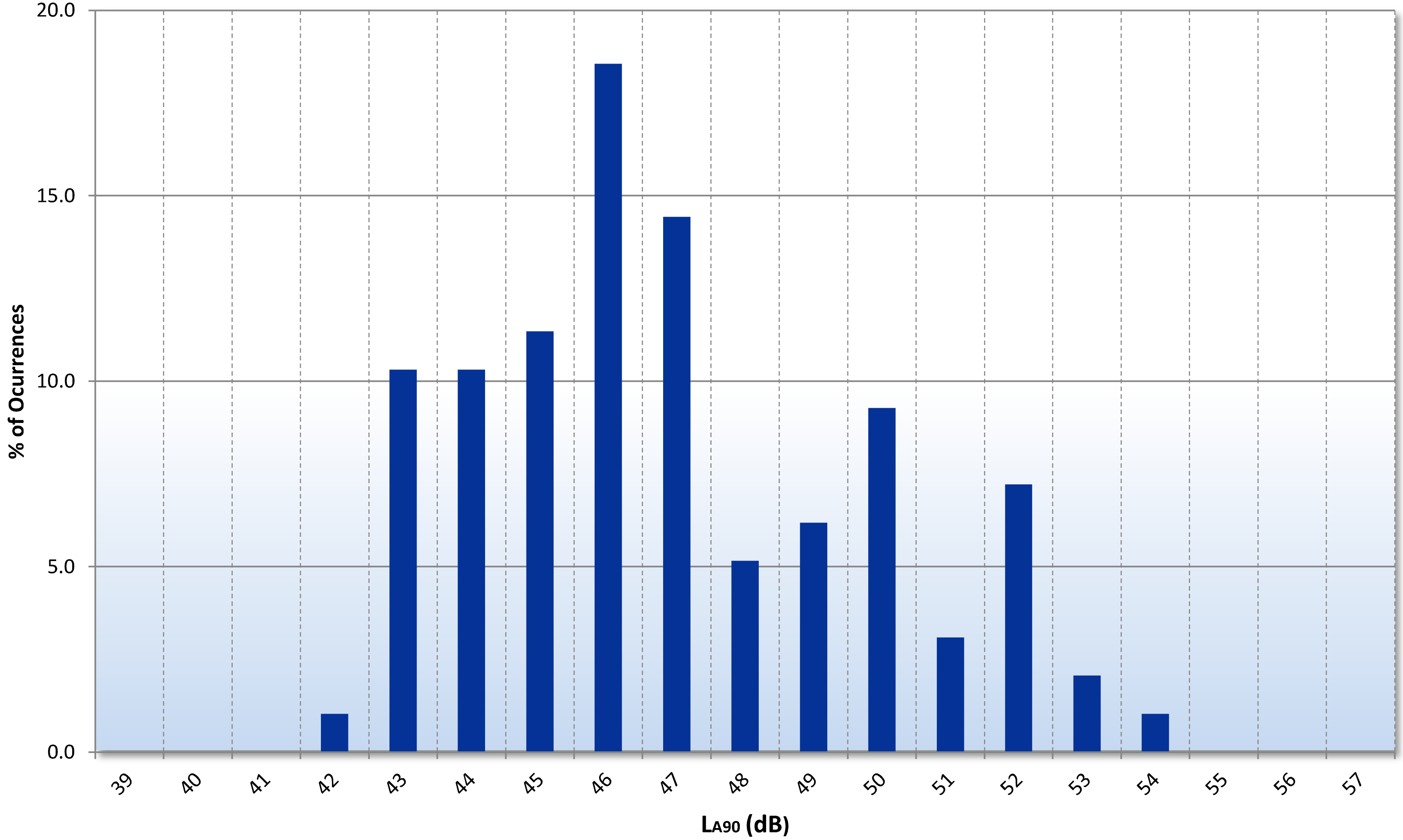


Figure 20048.L90

APPENDIX A

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPENDIX A

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.

APPENDIX B

Phoenix Yard, 65 & 67-69 Kings Cross Road, London

PLANT NOISE EMISSIONS CALCULATIONS

Source: Rooftop plant installation Receiver: Closest residential window	Frequency, Hz 63	125	250	500	1k	2k	4k	8k	dB(A)
Heat Exchange Unit 1 - Noise Emissions from Air Discharge									
Nuaire XBC85-H-NES (Sound Power Level)	88	88	89	88	90	85	79	71	
Correction due to duct end reflection, dB	-8	-4	-1	0	0	0	0	0	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Directivity correction, dB	2	1	-1	-1	-11	-11	-11	-11	
Minimum attenuation provided by the building envelope, dB	-5	-5	-5	-6	-6	-8	-9	-12	
Minimum attenuation provided by distance (4m), dB	-12	-12	-12	-12	-12	-12	-12	-12	
Minimum attenuation required from proposed silencer, dB	-6	-13	-23	-37	-43	-44	-35	-20	
Minimum attenuation required from proposed louvre at termination point, dB	-4	-3	-4	-6	-11	-13	-12	-10	
Total Noise Emissions from Air Handling Unit Air Exhaust Outlet, dB	**47**	**44**	**35**	**18**	**-1**	**-11**	**-8**	**-2**	**31**
Heat Exchange Unit 1 - Noise Emissions from Air Intake									
Nuaire XBC85-H-NES (Sound Power Level)	78	79	83	82	79	76	71	67	
Correction due to duct end reflection, dB	-8	-4	-1	0	0	0	0	0	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Directivity correction, dB	2	1	-1	-1	-11	-11	-11	-11	
Minimum attenuation provided by the building envelope, dB	-6	-7	-8	-10	-12	-15	-16	-16	
Minimum attenuation provided by distance (5m), dB	-14	-14	-14	-14	-14	-14	-14	-14	
Minimum attenuation required from proposed silencer, dB	-4	-7	-13	-19	-23	-23	-16	-13	
Minimum attenuation required from proposed louvre at termination point, dB	-4	-3	-4	-6	-11	-13	-12	-10	
Total Noise Emissions from Air Handling Unit Air Exhaust Outlet, dB	**36**	**37**	**34**	**24**	**0**	**-8**	**-6**	**-5**	**28**
Heat Exchange Unit 1 - Noise Emissions from Casing Breakout									
Nuaire XBC85-H-NES (Sound Power Level)	78	70	74	63	57	52	54	52	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by the building envelope, dB	-6	-7	-8	-10	-12	-15	-16	-16	
Minimum attenuation provided by distance (5m), dB	-14	-14	-14	-14	-14	-14	-14	-14	
Minimum attenuation required from acoustic lagging, dB	-10	-11	-12	-17	-25	-25	-25	-25	
Total Noise Emissions from Air Handling Unit Casing Breakout, dB	**40**	**30**	**32**	**14**	**-2**	**-10**	**-9**	**-11**	**25**
Heat Exchange Unit 2 - Noise Emissions from Air Discharge									
Nuaire XBC85-H-NES (Sound Power Level)	88	88	89	88	90	85	79	71	
Correction due to duct end reflection, dB	-8	-4	-1	0	0	0	0	0	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Directivity correction, dB	2	1	-1	-1	-11	-11	-11	-11	
Minimum attenuation provided by the building envelope, dB	-6	-8	-9	-11	-14	-16	-16	-16	
Minimum attenuation provided by distance (7m), dB	-17	-17	-17	-17	-17	-17	-17	-17	
Minimum attenuation required from proposed silencer, dB	-4	-7	-13	-19	-23	-23	-16	-13	
Minimum attenuation required from proposed louvre at termination point, dB	-4	-3	-4	-6	-11	-13	-12	-10	
Total Noise Emissions from Air Handling Unit Air Exhaust Outlet, dB	**43**	**42**	**36**	**26**	**6**	**-3**	**-1**	**-4**	**31**
Heat Exchange Unit 2 - Noise Emissions from Air Intake									
Nuaire XBC85-H-NES (Sound Power Level)	78	79	83	82	79	76	71	67	
Correction due to duct end reflection, dB	-8	-4	-1	0	0	0	0	0	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Directivity correction, dB	2	1	-1	-1	-11	-11	-11	-11	
Minimum attenuation provided by the building envelope, dB	-6	-8	-9	-11	-14	-16	-16	-16	
Minimum attenuation provided by distance (8m), dB	-18	-18	-18	-18	-18	-18	-18	-18	
Minimum attenuation required from proposed silencer, dB	-2	-4	-9	-15	-17	-14	-10	-8	
Minimum attenuation required from proposed louvre at termination point, dB	-4	-3	-4	-6	-11	-13	-12	-10	
Total Noise Emissions from Air Handling Unit Air Exhaust Outlet, dB	**34**	**35**	**33**	**23**	**0**	**-4**	**-4**	**-4**	**27**

Heat Exchange Unit 2 - Noise Emissions from Casing Breakout									
Nuaire XBC85-H-NES (Sound Power Level)	78	70	74	63	57	52	54	52	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by the building envelope, dB	-7	-8	-10	-12	-15	-18	-21	-24	
Minimum attenuation provided by distance (7m), dB	-17	-17	-17	-17	-17	-17	-17	-17	
Minimum attenuation required from acoustic lagging, dB	-10	-11	-12	-17	-25	-25	-25	-25	
Total Noise Emissions from Air Handling Unit Casing Breakout, dB	**36**	**26**	**27**	**9**	**-8**	**-16**	**-17**	**-22**	**20**
Extraction Fan - Noise Emissions from Duct Termination Point									
Gigabox GBW EC 400 B (A weighted Sound Power Level)	56	56	67	70	71	70	62	55	
A weighting correction, dB	26	16	9	3	0	-1	-1	1	
Correction due to duct end reflection, dB	-17	-12	-8	-4	-1	0	0	0	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by the building envelope, dB	-6	-8	-9	-11	-14	-16	-16	-16	
Minimum attenuation provided by distance (8m), dB	-18	-18	-18	-18	-18	-18	-18	-18	
Minimum attenuation required from proposed silencer, dB	-2	-4	-9	-15	-17	-14	-10	-8	
Total Noise Emissions from Extraction Fan Duct Termination Point, dB	**31**	**22**	**24**	**17**	**13**	**13**	**9**	**6**	**21**
Extraction Fan - Noise Breakout from Fan Casing Breakout									
Gigabox GBW EC 400 B (A weighted Sound Power Level)	46	46	54	49	48	46	43	39	
A weighting correction, dB	26	16	9	3	0	-1	-1	1	
Conversion to SPL@1m	-11	-11	-11	-11	-11	-11	-11	-11	
Correction due to surface reflections (1), dB	3	3	3	3	3	3	3	3	
Minimum attenuation provided by the building envelope, dB	-6	-8	-9	-11	-14	-16	-16	-16	
Minimum attenuation provided by distance (8m), dB	-18	-18	-18	-18	-18	-18	-18	-18	
Total Noise Emissions from Fan Casing Breakout, dB	**40**	**28**	**28**	**15**	**8**	**3**	**0**	**-2**	**22**
Total Specific Level of all Plant Unit Installations	**50**	**47**	**42**	**30**	**15**	**14**	**10**	**8**	**36**
BS4142 Acoustic Feature Corrections									
Tonality	0	0	0	0	0	0	0	0	
Impulsivity	0	0	0	0	0	0	0	0	
Intermittency	0	0	0	0	0	0	0	0	
Total Rating Noise Level of all Plant Unit Installations at Receiver	**50**	**47**	**42**	**30**	**15**	**14**	**10**	**8**	**36**

Representative Background Noise Level	**46**

ANTI-VIBRATION MOUNTING SPECIFICATION REFERENCE DOCUMENT

1.0 General

1.1 All mountings shall provide the static deflection, under the equipment weight, shown in the schedules. Mounting selection should allow for any eccentric load distribution or torque reaction, so that the design deflection is achieved on all mountings under the equipment, under operating conditions.

1.2 It is the supplier's responsibility to ensure that all mountings offered are suitable for the loads, operating and environmental conditions which will prevail. Particular attention should be paid to mountings which will be exposed to atmospheric conditions to prevent corrosion.

1.3 All mountings shall be colour coded, or otherwise marked, to indicate their load capacity, to facilitate identification during installation.

Where use of resilient supports allows omission of pipe flexible connections for vibration/noise isolation, it shall be the Mechanical Service Consultant's or Contractor's responsibility to decide whether such devices are required to compensate for misalignment or thermal strain.

2.1 Type A Mounting (Caged Spring Type)

2.1.1 Each mounting shall consist of cast or fabricated telescopic top and bottom housings enclosing one or more helical steel springs as the principle isolation elements, and shall incorporate a built-in levelling device. The housing should be designed to permit visual inspection of the springs after installation, i.e. the spring must not be totally enclosed.

2.1.2 The springs shall have an outside diameter of not less than 75% of the operating height, and be selected to have at least 50% overload capacity before becoming coil-bound.

2.1.3 The bottom plate of each mounting shall have bonded to it a rubber/neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

2.1.4 Mountings incorporating snubbers or restraining devices shall be designed so that the snubbing, damping or restraining mechanism is capable of being adjusted to have no significant effect during the normal running of the isolated machine.

2.1.5 All nuts, bolts or other elements used for adjustment of a mounting shall incorporate locking mechanisms to prevent the isolator going out of adjustment as a result of vibration or accidental or unauthorised tampering.

2.2 Type B Mounting (Open Spring Type)

2.2.1 Each mounting shall consist of one or more helical steel springs as the principal isolation elements, and shall incorporate a built-in levelling device.

2.2.2 The springs shall be fixed or otherwise securely located to cast or fabricated top and bottom plates, shall have an outside diameter of not less than 75% of the operating height, and shall be selected to have at least 50% overload capacity before becoming coil-bound.

2.2.3 The bottom plate shall have bonded to it a rubber/ neoprene pad designed to attenuate any high frequency energy transmitted by the springs.

2.3 Type C Mounting (Rubber/Neoprene Type)

Each mounting shall consist of a steel top plate and base plate completely embedded in oil resistant rubber/neoprene. Each mounting shall be capable of being fitted with a levelling device, and should have bolt holes in the base plate and a threaded metal insert in the top plate so that they can be bolted to the floor and equipment where required.

3.0 Plant Bases

3.1 **Type A Bases (A.V. Rails)**

An A.V. Rail shall comprise a steel beam with two or more height-saving brackets. The steel sections must be sufficiently rigid to prevent undue strain in the equipment and if necessary should be checked by the Structural Engineer.

3.2 **Type B Bases (Steel Plant Bases)**

Steel plant bases shall comprise an all-welded steel framework of sufficient rigidity to provide adequate support for the equipment, and fitted with isolator height saving brackets. The frame depth shall be approximately 1/10 of the longest dimension of the equipment with a minimum of 150 mm. This form of base may be used as a composite A.V. rail system.

3.3 **Type C Bases (Concrete Inertia Base: for use with steel springs)**

These shall consist of an all-welded steel pouring frame-work with height saving brackets, and a frame depth of approximately 1/12 of the longest dimension of the equipment, with a minimum of 100 mm. The bottom of the pouring frame should be blanked off, and concrete (2300 kg/m^3) poured in over steel reinforcing rods positioned 35 mm above the bottom. The inertia base should be sufficiently large to provide support for all parts of the equipment, including any components which over-hang the equipment base, such as suction and discharge elbows on centrifugal pumps.

XBC85 HORIZONTAL HEAT EXCHANGE UNITS
PERFORMANCE & TECHNICAL INFORMATION

XBC85 HORIZONTAL FAN - SOUND DATA

Fan Speed	Sound Power Levels (dB re 1 pW)	Frequency (Hz) 63	125	250	500	1000	2000	4000	8000	Spherical dBA@3m	Fan Speed	External Static Pressure (Pa) 63	125	250	500	1000	2000	4000	8000	Spherical dBA@3m
100%	Induct Intake	84	85	89	88	85	82	77	73	52	50%	69	70	74	73	70	67	62	58	37
	Induct Supply	85	82	84	84	81	75	63	50			70	67	69	69	66	60	48	35	
	Induct Discharge	94	94	95	94	96	91	85	77			79	79	80	79	81	76	70	62	
	Induct Extract	86	79	84	82	78	74	66	65			71	64	69	67	63	59	51	50	
	Casing Radiated	84	76	80	69	63	58	60	48			69	61	65	54	48	43	45	33	
75%	Induct Intake	78	79	83	82	79	76	71	67	46	25%	57	58	62	61	58	55	50	46	25
	Induct Supply	79	76	78	78	75	69	57	44			58	55	57	57	54	48	36	23	
	Induct Discharge	88	88	89	88	90	85	79	71			67	67	68	67	69	64	58	50	
	Induct Extract	80	73	78	76	72	68	60	59			59	52	57	55	51	47	39	38	
	Casing Radiated	78	70	74	63	57	52	54	42			57	49	53	42	36	31	33	21	

*Casing Radiated (Breakout).

ATTENUATOR (SIDE BY SIDE) DIMENSIONS (mm), DYNAMIC INSERTION LOSS (dB) & WEIGHTS (kg)

Attenuator* Code	Attenuator Dimensions Length	Width	Height**	Dynamic Insertion Loss (dB) 63	125	250	500	1000	2000	4000	8000	Attenuator Weight (kg)	Packed Weight (kg)
XBC85-H-SIL900	900	2000	876	0	6	8	18	22	20	16	15	185	190
XBC85-H-SIL900WP	900	2000	1001	0	6	8	18	22	20	16	15	190	195

*Attenuator sections are side by side, one piece modules. **Includes 76mm base frame.

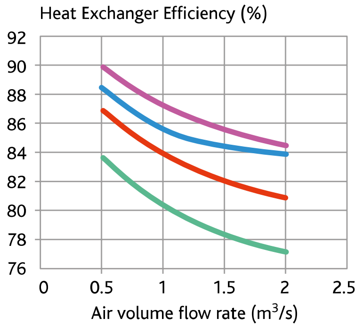
COUNTERFLOW HEAT EXCHANGER EFFICIENCY (%)

Performance based on:
Indoor Conditions 21 Deg C / 50 % RH

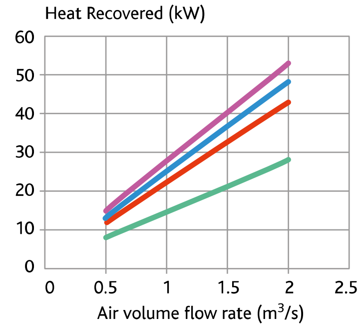
Key to performance curves

Intake Temperature (Deg C)
-5 Deg C Intake Typically Specified Values
-3 Deg C Intake Typically Specified Values
-1 Deg C Intake Typically Specified Values
6 Deg C Approx. Average outdoor temperature (UK heating season)

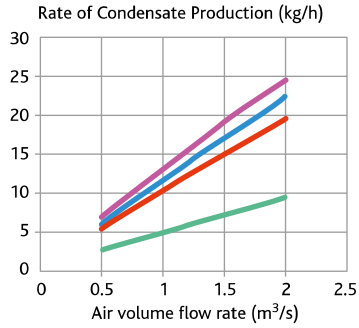
Heat Exchanger Efficiency (%)



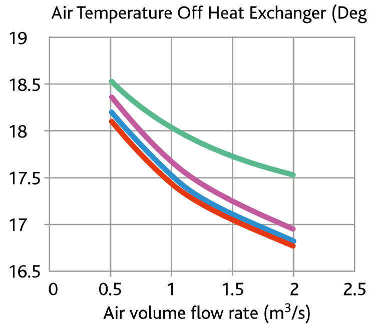
Heat Recovered (kW)



Rate of Condensate Production (kg/h)



Air Temperature Off Heat Exchanger (Deg C)



HEATING COIL DATA LPHW

LPHW Deg C	Airflow (m³/s)	Output (kW)	Air Off Temp (C*)	Water flow (l/s)	Coil ΔP (kPa)	Pipe Connection (mm)	Valve ΔP (kPa)	Valve Type
LPHW 82/71	1.5	36.3	30.0	0.81	13.1	22	20	2 Port
	1.1	31.6	33.9	0.69	9.4	22	20	
	0.75	24.7	37.4	0.54	5.8	22	20	
LPHW 80/60	1.5	29.4	26.3	0.37	2.6	22	20	2 Port
	1.1	25.6	29.4	0.31	1.9	22	20	
	0.75	20.0	32.2	0.24	1.1	22	20	
LPHW 60/40	1.5	17.1	19.5	0.20	0.8	22	20	2 Port
	1.1	14.8	21.2	0.17	0.6	22	20	
	0.75	11.6	22.9	0.13	0.4	22	20	

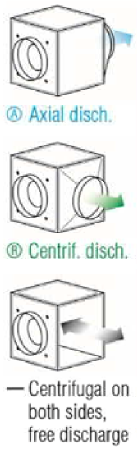
*Nb Limited to 30 Deg C for Ecosmart Units. Data based on 10 Deg C Air On temperature.

ECgreen Vent

Helios

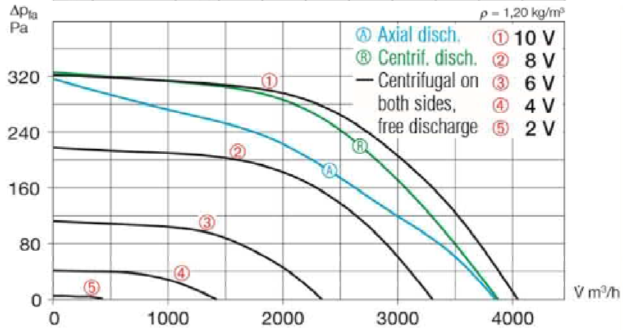
GB EC

Arbitrary installation position and assembly in five possible discharge directions.

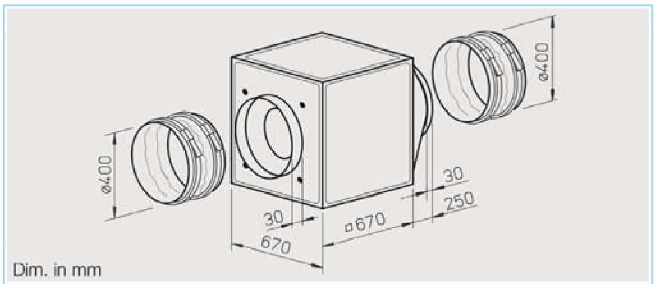


GBW EC 400 A

Frequency		Hz	Total	125	250	500	1k	2k	4k	8k
L_{WA}	Case breakout	dB(A)	56	52	52	47	43	40	35	27
L_{WA}	Intake	dB(A)	68	53	62	67	60	58	55	48
L_{WA}	Exhaust	dB(A)	71	61	62	64	67	62	57	48

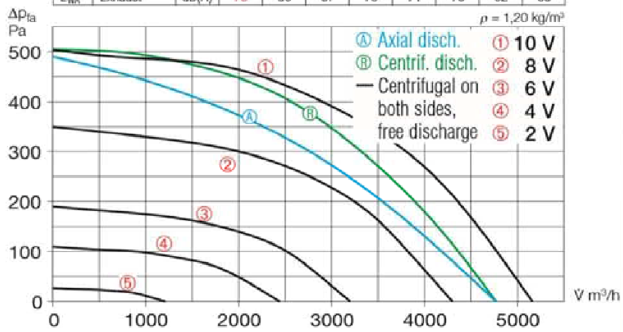


Voltage V	n min⁻¹	V̇ m³/h	P W	I A	Lp dB(A)	SFP kW/m³/s
	Free discharge					
10	1200	4040	209	1,2	36	0,19
8	990	3300	118	0,7	32	0,13
6	710	2340	49	0,3	25	0,08
4	430	1420	21	0,2	18	0,05



GBW EC 400 B

Frequency		Hz	Total	125	250	500	1k	2k	4k	8k
L_{WA}	Case breakout	dB(A)	57	46	54	49	48	46	43	39
L_{WA}	Intake	dB(A)	72	53	64	65	66	67	59	53
L_{WA}	Exhaust	dB(A)	76	56	67	70	71	70	62	55



Voltage V	n min⁻¹	V̇ m³/h	P W	I A	Lp dB(A)	SFP kW/m³/s
	Free discharge					
10	1500	5160	395	2,52	37	0,28
8	1250	4300	244	1,63	34	0,21
6	930	3200	117	0,85	29	0,13
4	710	2440	63	0,49	25	0,09

Specification

Casing

Self-supporting frame construction made from hollow aluminium profiles. Lined with 20 mm thick double-walled side panels made from galvanised sheet steel, sound and thermally insulated with flame-retardant mineral wool. Intake cone for ideal airflow, spigot and flexible connector for duct connection. With discharge adapter (from square to circular) on the pressure side for low-loss discharge and flexible sleeve to reduce vibration transmission. Simple positioning with standard crane hooks.

Impeller

Impeller and remaining design see description on page 241.

Accessories

Anti vibration mounts for installation indoors. 1 set = 4 pcs.
SDD-U Ref. no. 5627

Wall bracket for wall mounting.
GB-WK 400 Ref. no. 5626

External weather louvre to cover exhaust opening.
GB-WSG 400 Ref. no. 5639

Outdoor cover hood for protected outdoor installation.
GB-WSD 400 Ref. no. 5748

Condensate collector with condensate spigot (centre) for pipe connection.
GB-KW 400 Ref. no. 5644

ECgreen Vent

60% Saving *

* with speed control

Accessory details	Page
Universal control system, electronic controller, speed-potentiometer	539 on

Type	Ref. no.	Connection Ø	Air flow volume (FID)	R.P.M.	Sound press. case breakout	Motor power	Current	Wiring diagram	max. air flow temperature	Weight net approx.	Universal control system		Speed-potentiometer flush		Speed-potentiometer surface	
		mm	V m³/h	min^{-1}	dB(A) in 4 m	kW	A	No.	+ °C	kg	Type	Ref. no.	Type	Ref. no.	Type	Ref. no.
Single phase motor, 1~, 230 V, 50/60 Hz, EC motor, protection to IP 54																
GBW EC 400 A	5817	400	4050	1200	36	0.35	2.00	973	50	43.0	**EUR EC** 1) 2)	1347	**PU 24** 1)	1736	**PA 24** 1)	1737
GBW EC 400 B	5810	400	5160	1500	37	0.62	3.70	976	50	46.0	**EUR EC** 1) 2)	1347	**PU 24** 1)	1736	**PA 24** 1)	1737

1) several EC fans can normally be connected 2) alternative electronic differential pressure/temp. controller (EDR/ETR, No. 1437/1438) or three-step speed switch (SU/SA, No. 4266/4267), see accessories