Noise & Vibration Consultants
4 Mulberry Place, Pinnell Road, London, SE9 6AR
Tel: 020 8859 0303
Email: **info@acousticsplus.co.uk** Web: www.acousticsplus.co.uk

ACOUSTICS PLUS

Proposed Installation of Mechanical Plant

23 Downside Crescent, London, NW3 2AN

Environmental Noise Assessment

Author: Phil Huffer B.Sc. (Hons) MIOA
Principal Consultant

Doc Ref: 103544.ph.Issue1

Company Registration Number: 4304440
VAT Registration Number: 788 2610 94

Proposed Installation of Mechanical Plant	
Project Address:	23 Downside Crescent London NW3 2AN
Project Reference:	103544

Issue/Revision Record

Issue:	Date:	Remarks:	Author:
1	07/02/2018	First Issue	Phil Huffer
2	08/02/2018	Second Issue- minor amendment	Phil Huffer

	Signature:	Print:	Title:	Date:
Author:		**Phil Huffer**	**Principal Consultant**	**08/02/2018**
Reviewer:		**Andy Dodd**	**Senior Consultant**	**08/02/2018**

1. INTRODUCTION

1.1 Acoustics Plus Ltd (APL) is an independent firm of multi-disciplinary acoustic engineers. APL is engaged by both private and public sector clients.

1.2 APL is a registered member of The Association of Noise Consultants (ANC) and the author is a corporate member of The Institute of Acoustics (IOA).

1.3 APL has been instructed by the applicant's architect, Brod Wight Architects, to consider and advise upon the noise implications of the proposed installation of a climate control system.

1.4 The climate control system will consist of 1No. external condenser unit that will be mounted within an acoustic enclosure at the end of the rear garden.

1.5 It is understood the Local Planning Authority (LPA) require further information on noise levels from the proposed installation in order to fully assess the noise impact upon the surrounding neighbourhood.

1.6 This report provides the response to the LPA, on behalf of the Applicant.

2. BASELINE SITUATION

2.1 The Application Site (the "site") is situated at 23 Downside Crescent, London, NW3 2AN. The site is a semi-detached property arranged over a number of levels. The rear of the site is shown in Figures 1 to 8 attached.

2.2 The property is currently undergoing an extensive refurbishment. As part of this refurbishment, it is proposed to install a mechanical climate control system that will provide cooling to the property.

2.3 The external condenser unit associated with the climate control system will be located in an acoustic enclosure at the end of the rear garden of the property. The proposed location of the enclosure and condenser can be seen in Diagram 1 overleaf. Ventilation to the enclosure will be provided naturally.

2.4 The nearest windows to the enclosure located in the rear garden are the ground floor windows of the nearest noise sensitive properties considered to be adjacent at No.21 and No.25 Downside Crescent (see Figures 1 and 4).

2.5 The proposed condenser unit is a Daikin RXYSCQ4TV1. The noise data for this unit was obtained from published data from manufacturer Daikin (a copy of the data sheet is provided in Appendix A).

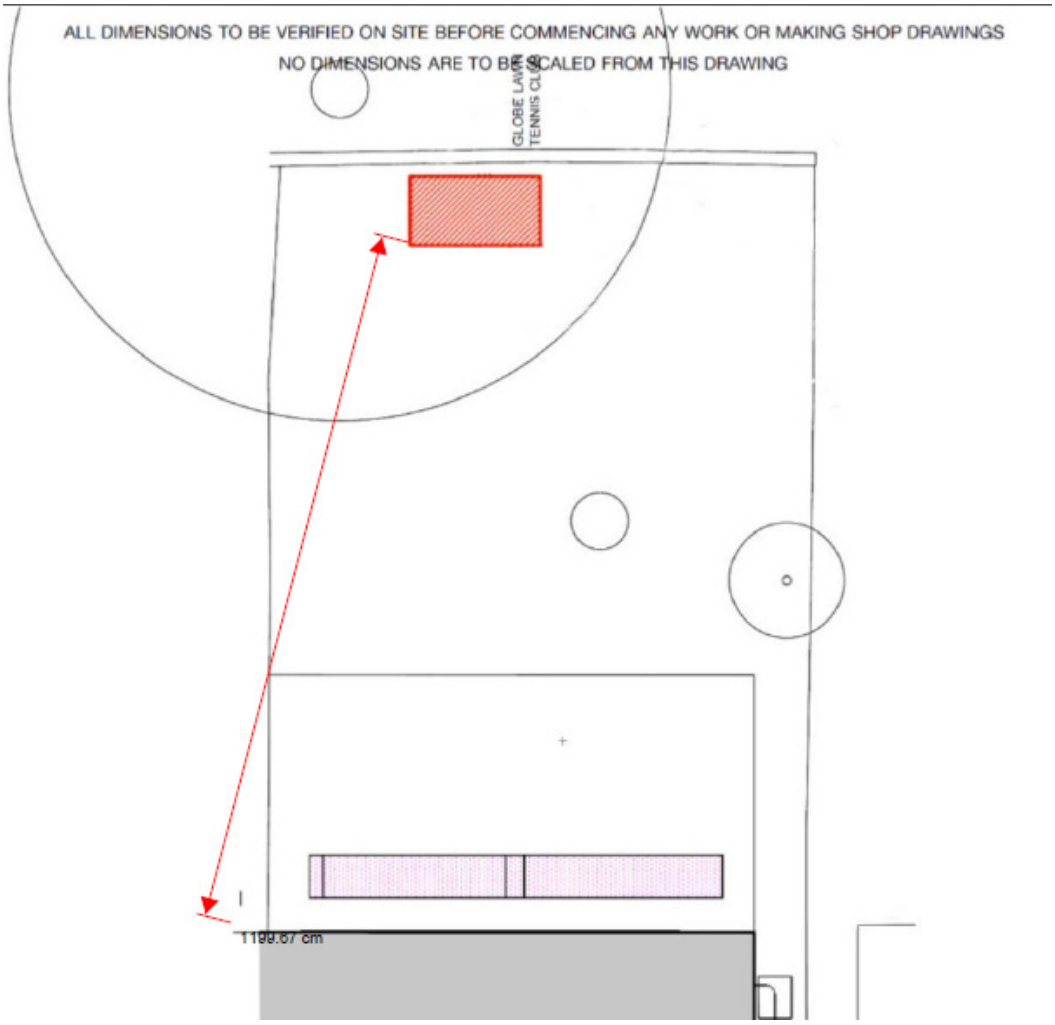


Diagram 1

3. NOISE OUTLINE

3.1 In order to produce an environmental noise assessment, consideration must be given to the prevailing background noise in the locality of the installation.

3.2 Measurements of background noise were obtained over a 24 hour period at a location deemed representative of background noise levels experienced at the nearest noise sensitive façade. The measurements were obtained within the rear garden of No.23 Downside Crescent.

3.3 The particulars of the measurement exercise are recorded below. The weather conditions were considered appropriate to monitor environmental noise.

Date: 30th – 31st January 2018
Start Time: 12:15 hrs
Location: rear garden, 23 Downside Crescent

Weather conditions

Date	Precipitation	Wind	Temperature
30/01/18	0.0mm	9km/h	9 ºC
31/01/18	0.2mm	7km/h	6 ºC

3.4 Minimum background and average noise levels are shown in Table 1 below with the full 24 hour time history shown in Diagram 2 (L_{Aeq} and L_{A90}). Daytime levels were influenced by nearby construction noise.

Time period	Lowest $L_{A90,15min}$	Average $L_{Aeq,T}$
07:00-23:00hrs	42	52
23:00-07:00hrs	42	46

Table 1

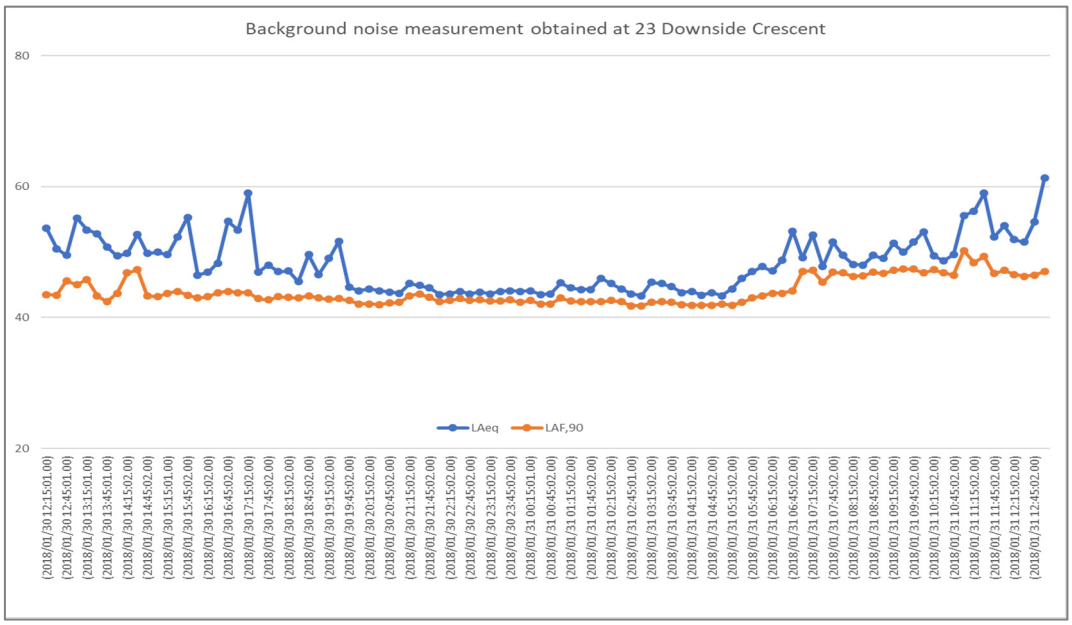


Diagram 2

4. DESIGN CRITERIA

4.1 Information regarding the noise levels not to be exceeded by the proposed installation was extracted from the LPA (London Borough of Camden) Local Plan Adopted version June 2017 (Appendix 3 Noise thresholds).

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).

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing noise sensitive receptor	Assessment Location	Design Period	LOAEL (green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dB L_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dB L_{Amax}

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

**levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

4.1 The procedure contained in BS4142 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

4.2 The specific sound level is converted to a rating level by adding penalties to account for either tonality or impulsivity. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.

4.3 The penalty for tonal elements is between 0dB and 6dB, and the standard notes:

"Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."

4.4 The penalty for impulsive elements is between 0dB and 9dB, and the standard notes:

"Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

4.5 The background sound level should be established in terms of the LA90 noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15 minute intervals. The standard states that:

"A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."

4.6 The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

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 +5 dB is likely to be an indication of an adverse impact, depending on the context.
d) 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.
Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

4.7 The standard goes on to note that:

"*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."*

4.8 In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."

4.9 The background noise levels were assessed using statistical analysis of the measured data, as directed in BS4142. The histogram for the operational hours of the condenser unit can be seen in Diagram 3.

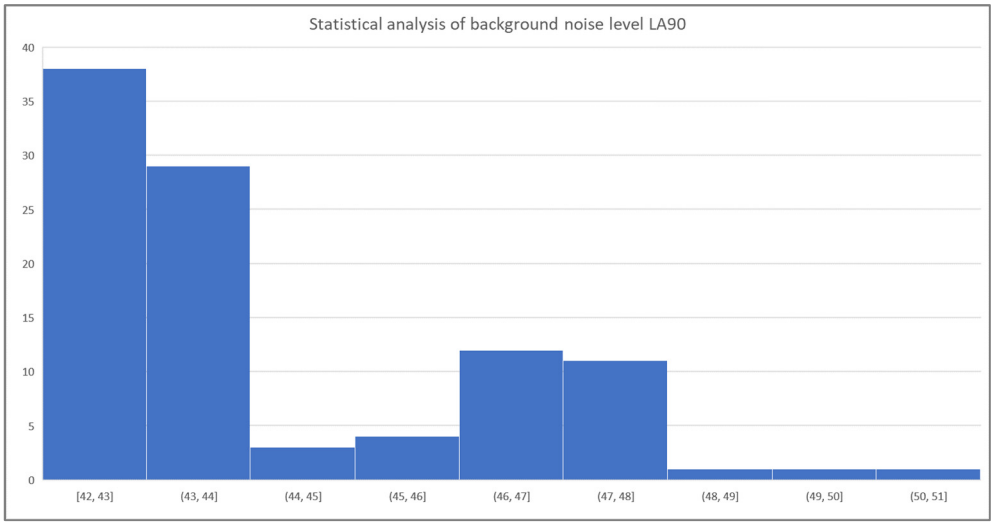


Diagram 3

4.10 The background noise level did not vary significantly throughout the measurement period. In this instance the most commonly occurring background noise level and the lowest background noise level during the operational hours of the condenser was 42dB $L_{A90,15min}$. In the context in which the sound occurs, 42dB $L_{A90,15min}$ is considered appropriate.

4.11 In determining a rating level, corrections to account for tonality and impulsivity must be added to the specific noise level of the unit. The octave band sound levels of the condenser (see Appendix A) do not seem to indicate any tonal component. A correction of 3dB was added to account for perceptible impulsivity.

4.12 The plant noise emission criteria that should not be exceeded is therefore based on Table 1 and is shown in Table 2 below. This level should not be exceeded at the nearest noise sensitive façade and is indicative of 13dB below the considered background noise.

Noise emission limit for mechanical plant
L_{Aeq} 29dB

Table 2

5. EQUIPMENT

5.1 All background noise measurements were obtained using the following equipment:

- Svantek Svan971 Class 1 Serial No. 51704
- Rion Calibrator Type NC-74 Class 1 Serial No. 00410215

5.2 The relevant equipment carries full and current traceable calibration. The equipment, where necessary, was calibrated prior to and after the measurements were carried out.

6. CALCULATIONS

6.1 In order to predict the noise impact of the climate control system, consideration has been given to noise egress from the condenser unit to the nearest noise sensitive façade.

6.2 In considering the propagation of noise from the condenser, consideration was given to its location within an acoustic enclosure and point source propagation to the nearest noise sensitive window. The following formulas were utilised:

$$L_p = L_w + 10log_{10}T - 10log_{10}V + 14$$

Where L_p *is the reverberant sound pressure level in the enclosure*
L_w *is the sound power level of the condenser unit*
T is the enclosure reverberation time, s
V is the enclosure volume, m^3

$$L_{p_2} = L_{p_1} - R - 6$$

Where L_{p_2} *is the sound pressure level close to the enclosure on the outside*
L_{p_1} *is the reverberant sound pressure level in the enclosure*
R is the sound reduction index of the acoustic enclosure

6.3 The calculation is based on the Transmission Loss figures provided by Environ Technologies Ltd. These values are shown in Table 3. The manufacturers data sheet is shown in Appendix A. Distances were obtained from scaled drawings.

Acoustic enclosure	Transmission Loss Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Environ Lite ELV1.1.25AC	14	16	23	30	37	39	38	39

Table 3

6.4 The calculation exercise provided the following results. A further correction of 3dB to account for a reflecting plane behind the enclosure was considered.

Heating Mode	Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Daikin RXYSCQ4TV1	71	71	66	67	64	55	49	43	68
Reverberant Lp in enclosure	77	77	72	73	70	61	55	49	74
Acoustic enclosure	14	16	23	30	37	39	38	39	
Level outside of enclosure	57	55	43	37	27	16	11	4	42
Distance attenuation	-22	-22	-22	-22	-22	-22	-22	-22	
Reflecting plane (x1)	3	3	3	3	3	3	3	3	
Façade level	38	36	24	18	8	0	0	0	23

Table 4

6.5 In order to comply with the requirements of the LPA, any noise from the proposed installation of mechanical plant should not exceed a level of 29 dBA (13dB below the statistically considered measured background noise over the operational hours of the plant) at 1m from the nearest noise sensitive façade.

6.6 The calculated noise impact is 23dBA. The calculation exercise (Table 4) demonstrates that the proposed installation meets the LPA criteria by 6dB with the noise impact 19dB lower than the statistically considered measured background noise level of 42dB L_{A90}.

7. CONCLUSION

7.1 The foregoing assessment indicates that the proposed installation meets the requirements imposed by the LPA. Additional mitigation measures will not be required.

7.2 Lest there be any misunderstanding, the mitigation measures included in this report are as follows:

(a) Acoustic enclosure lined with transmission loss data as published by Environ Technologies Ltd.

7.3 In the event that an alternative manufacturer of condenser is used or an alternative acoustic enclosure is specified, the calculation exercise should be revisited to ensure that compliance with the LPA requirements is maintained.

Figures

Rear of 23 Downside Crescent, London


Figure 1


Figure 2


Figure 3


Figure 4


Figure 5


Figure 6


Figure 7

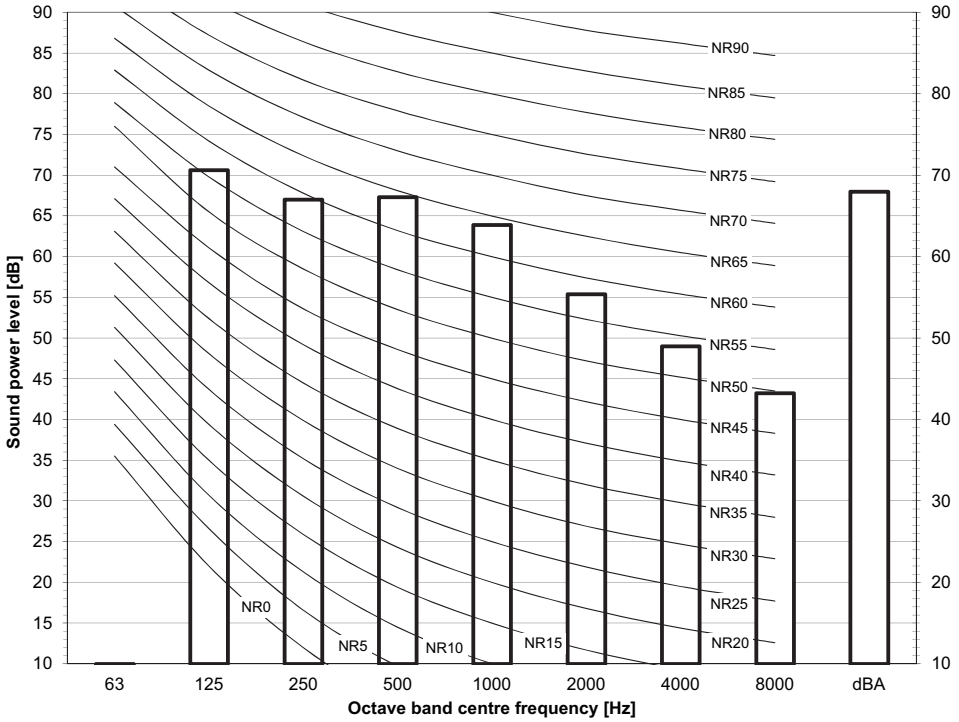

Figure 8

Appendix A

11 Sound data

11 - 1 Sound Power Spectrum

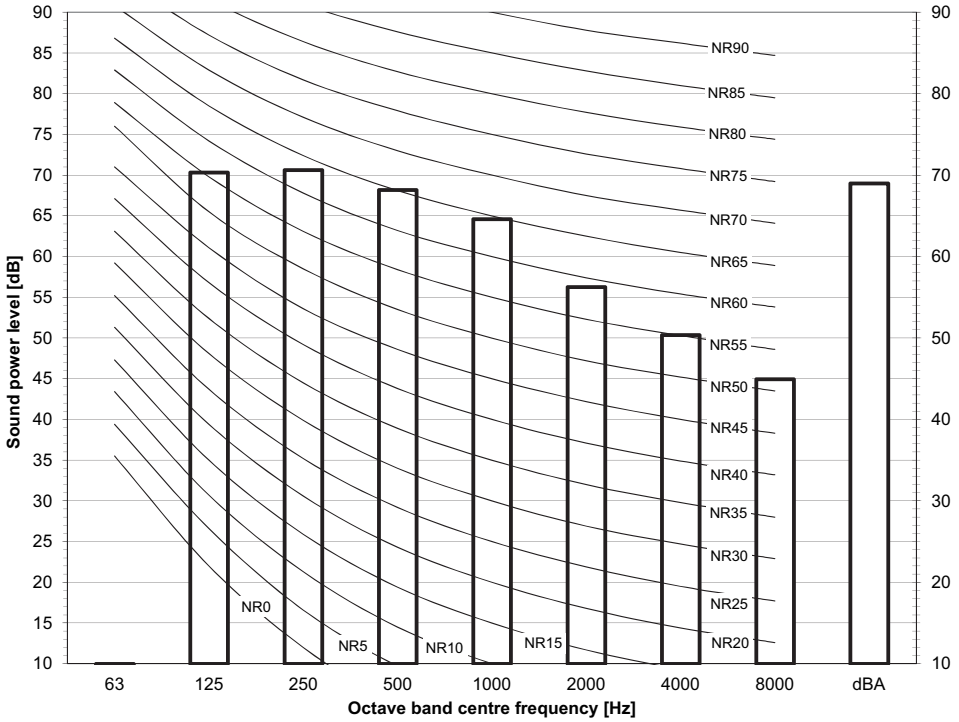
RXYSCQ4TV1



Notes
- dBA = A-weighted sound power level (A scale according to IEC).
- Reference acoustic intensity 0dB = 10E-6µW/m²
- Measured according to ISO 3744

3D098238

RXYSCQ5TV1



Notes
- dBA = A-weighted sound power level (A scale according to IEC).
- Reference acoustic intensity 0dB = 10E-6µW/m²
- Measured according to ISO 3744

3D098239

Environ Technologies Ltd
Regus House, 1010 Cambourne Business Park
Cambourne, Cambridgeshire, UK, CB23 6DP
Tel: +44 (0)870 383 3344
Fax: +44 (0)1223 598001
www.environ.co.uk

environlite ELV1.1.25AC Acoustic Performance Data (March 2010)

Noise Measurement Information:

Test: Environ Lite Acoustic Enclosure — W 1700mm x D 1000mm x H 1550mm

Test Standard:

BS EN ISO 140-3 Acoustics - Measurement of Sound Insulation in Buildings and of Building Elements - Part 1: Airborne Sound Insulation

Sound Level Measuring Equipment:

Norsonic 830 RTA Precision Sound Analyser Type 1
CEL 284/2 Acoustic Calibrator Type 1
JBL Loudspeaker driven by CEL Loudspeaker driven by 830 White Noise Source

Transmission Loss Data:

Transmission Loss — Environ ELV1.1.25AC Acoustic Enclosure							
Octave Frequency in Hertz (dB ref 2 x 10^{-5} Pascal's)							
63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
14	16	23	30	37	39	38	39
Summary							
Transmission Loss Equates to an Overall Reduction of 26 dB(A)							

Support Information:

Monitoring was carried out using the BS3740 technique, insofar as measurements were taken in each quadrant and the results averaged. Internal Test Room: W 6m x D 16m x H 5m. Background noise in the semi-reverberant test room was such as not to interfere with the practical measurements