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46 BIRCHINGTON ROAD
LONDON

NOISE IMPACT ASSESSMENT

Technical Report: R4626-3 Rev 0

Date: 29th August 2014

For: Mr Ben Baker
The Old Barn
Mountway
Potters Bar
Hertfordshire
EN6 1ER

24 Acoustics Document Control Sheet

Project Title: 46 Birchington Road, London – Noise Impact Assessment

Report Ref: R4626-3 Rev 0

Date: 29th August 2014

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For and on behalf of 24 Acoustics Ltd				

Document Status and Approval Schedule

Revision	Description	Prepared By	Approved By
0	Approved For Issue	Chris McConnell	Stephen Gosling

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1.0 INTRODUCTION

1.1 24 Acoustics Ltd has been instructed by Mr Ben Baker to undertake a noise impact assessment in relation to a proposed change of use from A1 to A3 (restaurant) at 46 Birchington Road London.

1.2 A previous application for proposed change of use at the site was refused by London Borough of Camden (decision notice reference 2013/1491/P, dated 2nd July 2013) and was then subsequently dismissed at appeal (reference APP/X5210/A/13/2204843). Although the principal of the proposed use was accepted, it was considered that insufficient details regarding noise from plant and equipment had been submitted hence this report has been written to provide this information.

1.3 The proposed restaurant, on the ground and basement floors, will include new plant. The first floor of the property is currently residential premises. Accordingly this noise impact assessment has included:

- Background noise monitoring;
- Determination of external noise limits for new plant;
- Assessment of noise from the proposed plant;
- Assessment of sound insulation between ground floor premises and first floor flats above.

1.4 This report presents the results of the assessment, following a site visit and background noise survey undertaken between the 18th and 23rd April 2013.

1.5 All noise levels in this report are presented in dB relative to 20μPa.

2.0 SITE DESCRIPTION

2.1 46 Birchington Road is a two-storey building with a basement. The basement and ground floors were previously used for retail purposes but are now vacant. Two residential flats are located at first floor level. The site is situated close to the junction with Kilburn High Road, which is the dominant source of ambient noise in the area.

2.2 The surrounding buildings are a mixture of residential, retail and commercial premises. The adjacent retail unit at 44 Birchington Road is currently used as a pet shop and the adjoining property to the rear at 108 Kilburn High Road is a commercial premises. Hence, aside from the first floor flats within the building, there are no other residential properties structurally connected to the premises.

2.3 Residential flats are located on upper floors to the south-west, across the passageway at the rear of 104-106 Kilburn High Road, with the nearest windows at a distance of 3m from the premises. Residential properties are also located to the rear of the site, towards the north-west, off Quex Mews and along Birchington Road to the north-east.

2.4 The layout of the site and surrounding buildings is shown in Figure 1.

2.5 It is intended to submit a planning application for a change of use of the ground floor and basement of the premises from A1 (retail) to A3 (restaurant).

2.6 The proposals show the restaurant seating area and bar will be located on the ground floor, with the kitchen, back-of-house areas and further seating on the basement floor. New plant is proposed which will comprise supply and extract ventilation fans.

2.7 24 Acoustics has been advised that, for the purposes of this assessment, the operating hours of the plant will be from 10:00 to 23:30 hours Monday to Saturday and from 10:00 to 22:30 hours on Sundays and Bank Holidays, in line with the proposed hours of use of the restaurant.

3.0 CRITERIA

National Planning Policy Framework and Noise Policy Statement for England

3.1 The National Planning Policy Framework (NPPF) [Reference 1] was published by the Department for Communities and Local Government in March 2012, and is now effective. This document is intended to replace specific guidance contained within previous planning policy guidance and statement documents which are currently in force. This document therefore supersedes PPG 24 [Reference 2] which previously provided guidance on noise relating to planning and new development. For noise the NPPF policy states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions, while recognising that many developments will create some noise.

3.2 The NPPF also refers to the Noise Policy Statement for England (NPSE) [Reference 3] which is intended to apply to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise. The NPSE sets out the Government's long-term vision to 'promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development' which is supported by the following aims.

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life;

3.3 The NPSE defines the concept of a 'significant observed adverse effect level' (SOAEL) as 'the level above which significant adverse effects on health and quality of life occur'. The following guidance is provided within the NPSE:

> *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

<u>BS 4142 (Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas)</u>

3.4 British Standard (BS) 4142 [Reference 4] provides a method for rating the effects of industrial noise on mixed residential and industrial areas. The standard advocates a comparison between the typical measured L_{A90} background noise level and L_{Aeq} noise level from the source being considered. For rating purposes if the noise source is tonal, intermittent or otherwise distinctive in character, a rating correction of +5 dB is applied. The standard states that a difference between the rating level and the background level of

+10 dB indicates that 'complaints are likely', a difference of +5 dB is of 'marginal significance' and a difference of −10 dB is a 'positive indication that complaints are unlikely'.

London Borough of Camden - Development Policy DP28

3.5 London Borough of Camden's Development Policy DP28 'Noise and Vibration' [Reference 5] provides guidance on the control of noise and vibration through planning. The policy states "Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted".

3.6 Specifically in relation to plant and machinery, Policy DP28 states "The Council will only grant permission for plant and machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds."

3.7 The London Borough of Camden's requirements for noise from fixed plant are stated in Table E of DP28 which states that, for noise from plant and machinery, at 1 metre external to a sensitive façade the noise level should be 5 dB below the minimum external background noise level (dB $L_{A90,\ 15\ min}$). Where noise from the plant has a distinctive tonal or impulsive nature, the limits should be reduced by 5 dB (i.e. 10 dB below the minimum external background noise level). The daytime period is assessed between 07:00-19:00 hours, evening period between 19:00-23:00 hours and night time period between 23:00-07:00 hours.

4.0 ENVIRONMENTAL NOISE MEASUREMENTS AND RESULTS

4.1 A background noise survey was undertaken on site from the 18th to the 23rd April 2013. The microphone was installed at a height of approximately 6m above ground level. The measurement location used is considered representative of the nearest noise sensitive properties. The measurement location is shown in Figure 1.

4.2 Ambient noise levels were measured using the following equipment:

Rion(Type 1) precision grade sound level meter	Type NL-32;
Bruel and Kjaer acoustic calibrator	Type 4231.

4.3 The instrumentation was configured to continuously measure and store overall A-weighted statistical parameters including L_{Aeq} and L_{A90} (all measured on fast response) in 5 minute intervals. Measurements were made in accordance with BS 7445: 1991 "Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use" [Reference 6].

4.4 The instrumentation at the measurement location was equipped with an environmental microphone and an extension cable. The instrument was powered by external batteries and stored in a weatherproof case. The calibration of the instrumentation was checked before and after the tests and no signal variation occurred. Calibration of 24 Acoustics' equipment is traceable to National Standards. The weather at the start and end of the survey period was dry and the wind speed was less than 5 m/s. The weather during the survey period was variable with some periods of precipitation which have been removed from the analysis.

Results

4.5 The measured noise levels are shown graphically in Appendix B.

4.6 The measured background noise levels have been processed to obtain 15-minute values in order to derive plant noise emission limits in accordance with the requirements of the London Borough of Camden. 24 Acoustics has been advised that the operating hours of the plant will be from 10:00 to 23:30 hours Monday to Saturday and from 10:00 to 22:30 hours on Sundays and Bank Holidays. The lowest background noise level during the proposed hours of operation was 44 dB $L_{A90,\ 15\ minute}$.

5.0 PLANT NOISE ASSESSMENT

Limiting Criteria for New Plant

5.1 The London Borough of Camden requires that the noise level of the new plant should be at least 5 dB below the lowest existing background noise level (L_{A90}) at the nearest noise sensitive façade. As such the external plant noise limit, to be achieved at 1m from the nearest noise sensitive window, is shown below:

- 39 dB $L_{Aeq,\ 15\ minute}$ during the proposed operating hours

5.2 The above limit should be reduced by 5 dB if noise from the plant has a distinctive tonal or impulsive nature.

5.3 The plant noise limits should be achieved at the nearest noise sensitive properties; these are noted to be the residential flats on the first floor of the building, with the nearest window at a distance of approximately 1.5m from the external ductwork, 5m from the extract discharge and 4m from the supply intake. Residential properties are also located across the passageway at the rear of 104-106 Kilburn High Road, with the nearest window at a distance of approximately 2m from the external ductwork, 7m from the extract discharge and 4m from the supply intake. The noise sensitive properties are indicated on the site location plan in Figure 1.

Plant Noise Assessment

5.4 The proposed new plant is understood to comprise the following:

- Systemair MUB 100 630D4-L IE2 Extract Fan
- Soler & Palau TCBTx2/4 560 Supply Fan

5.5 The proposed plant and ductwork layout is shown on drawing number CBLD-10931-01 Rev D by Chiller Box, as reproduced in Figure 2.

5.6 The drawing by Chiller box shows that the supply and extract fans will be located inside the building. Atmospheric-side attenuators will be provided, also located inside the building. The supply fan will be ducted to an intake louvre and the extract ductwork will exit the building, once attenuated, and will discharge at roof level.

5.7 The manufacturer's plant noise level data for the supply and extract fans is stated in Table 1 below.

Plant Unit	**A-Weighted In-duct Sound Power Level (dB) per Octave Band Frequency, Hz**								**dBA**
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	
Systemair MUB 100 630D4-L IE2 Extract Fan - Outlet	60	78	82	84	83	80	75	67	**89**
Soler & Palau TCBTx2/4 560 Supply Fan - Inlet	57	79	83	86	89	84	78	72	**93**

Table 1: Supply and Extract Fans – Octave-band Sound Power Levels

5.8 For the purposes of the calculations, the above A-weighted sound power levels have been converted to linear (un-weighted) sound power levels.

5.9 Based on the manufacturers' stated noise levels, calculations have been undertaken to determine the plant noise levels at the nearest noise sensitive windows. The noise levels from the intake and discharge grilles and the noise breakout from the external ductwork have been calculated. The calculations have taken into account in-duct losses, end reflections, directivity and losses due to distance. Acoustic screening from the roof edge has also been included, where relevant.

5.10 From examination of the manufacturers' plant noise levels (in octave bands), it is not expected that the proposed plant will have any tonal characteristics. Therefore, no character correction, for tonality or other distinctive features, has been included in the calculations.

5.11 The calculations have determined the required performance of attenuation, in order to achieve the established plant noise limit at the nearest noise sensitive windows. The recommended attenuation measures are outlined below.

5.12 It is recommended that attenuation be installed, on the atmospheric side, to the supply fan intake and extract fan discharge, to achieve the required sound reduction performance specified in Table 2.

Plant Unit	**Required Minimum Sound Reduction Performance (dB) at Octave Band Frequency, Hz**							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Extract Fan - Outlet	9	24	30	29	27	28	14	9
Supply Fan - Inlet	6	25	30	31	32	29	24	22

Table 2: Required Performance of Atmospheric Attenuation to Supply Fan & Extract Fan

5.13 Attenuators will be located inside the building as shown on the drawing produced by Chiller Box.

5.14 To control noise breakout from ductwork, it is also recommended that the external ductwork should be lagged with a proprietary product which includes a barrier core of minimum superficial mass 5 kg/m^2.

5.15 The above recommendations have been included in the proposals as shown on drawing number CBLD-10931-01 Rev D by Chiller Box.

5.16 The plant noise calculations, with attenuation, are provided in Appendix C.

5.17 With the recommended attenuation installed, the total calculated cumulative noise level from the proposed plant would not exceed the established limit of 39 dB $L_{Aeq,\ 15\ minute}$ at the nearest noise sensitive windows, and would therefore be acceptable.

5.18 The above assessment has been undertaken for planning purposes only. External plant noise must be assessed during the detailed design of the proposed systems, and mitigation measures appropriately specified, to ensure that the proposed plant complies with the noise limits required by London Borough of Camden.

6.0 SOUND INSULATION ASSESSMENT

6.1 Airborne sound insulation tests of the existing separating floor, between ground and first floor, were undertaken on 23rd April 2013. The following equipment was used:

- Rion Type 1 sound level meter — Type NA28;
- Brüel and Kjær Class 1 acoustic calibrator — Type 4231;
- Combined amplifier and sound source — N/A.

6.2 The calibration of the measuring equipment was checked prior to and immediately following the tests, and no signal variation occurred. All instrumentation conforms to BS EN 61672-1 Class 1 accuracy and is calibrated to NPL standards.

6.3 The tests were carried out by Matthew Bennett who is registered with the Association of Noise Consultants to undertake pre-completion testing. Testing was carried out in accordance with the procedures detailed in Annex B of the Building Regulations Approved Document E [Reference 7].

6.4 The existing construction is understood to comprise a timber joist floor, with a suspended lay-in grid ceiling in the ground floor shop area.

6.5 The result of the airborne tests are shown below in Table 3 and also displayed in Appendix D in graphical and tabular format.

Source Room	Receiving Room	Sound Insulation [dB $D_{nT,w}+C_{tr}$]
Existing Shop Main Area (Ground Floor)	Flat B Living Room	44
Existing Shop Main Area (Ground Floor)	Flat B Bedroom 1	38
Existing Shop Main Area (Ground Floor)	Flat A Living Room	40
Existing Shop Main Area (Ground Floor)	Flat A Bedroom 1	39

Table 3: Airborne Sound Insulation Test Results

6.6 It is noted that Approved Document E requires separating floors to achieve a minimum airborne sound insulation performance of 43 dB $D_{nT,w}$ + C_{tr} for converted properties.

6.7 It is recommended that the separating floor should achieve a minimum airborne sound insulation performance of 65 dB $D_{nT,w}$. This high performance (in excess of the minimum requirements of the Building Regulations) accounts for the proposed A3 use of the ground floor.

6.8 In order to achieve the target sound insulation performance, based on the results in Table 3, it will be necessary to undertake remedial works to the separating floor construction. It is considered that the upgrade works, which will form part of the detailed design, are readily achievable.

7.0 CONCLUSIONS

7.1 A noise impact assessment has been carried out in relation to a proposed change of use from A1 to A3 (restaurant) at 46 Birchington Road London.

7.2 An environmental noise survey has been undertaken to determine the existing background noise levels. Based upon the survey results and Local Authority requirements, limiting criteria applicable to noise from the installation of external plant have been established.

7.3 Calculations have been undertaken, based on manufacturers' noise data, to determine the plant noise levels at the nearest noise sensitive window. Noise mitigation measures have been specified in order to ensure that noise from the plant will not exceed the established noise limit at the nearest noise sensitive window, during the proposed operating hours.

7.4 The calculations demonstrate that, with the recommended attenuation installed, the proposed plant will comply with the noise limits required by London Borough of Camden.

7.5 Testing has been carried out to determine the airborne sound insulation performance of the existing floor between the ground floor premises and first floor flats above. A target performance specification has been provided for the separating floor to account for the proposed A3 use.

REFERENCES

1. Department for Communities and Local Government. National Planning Policy Framework, March 2012.

2. Department for the environment, Planning Policy Guidance 24, Planning and Noise, 1994.

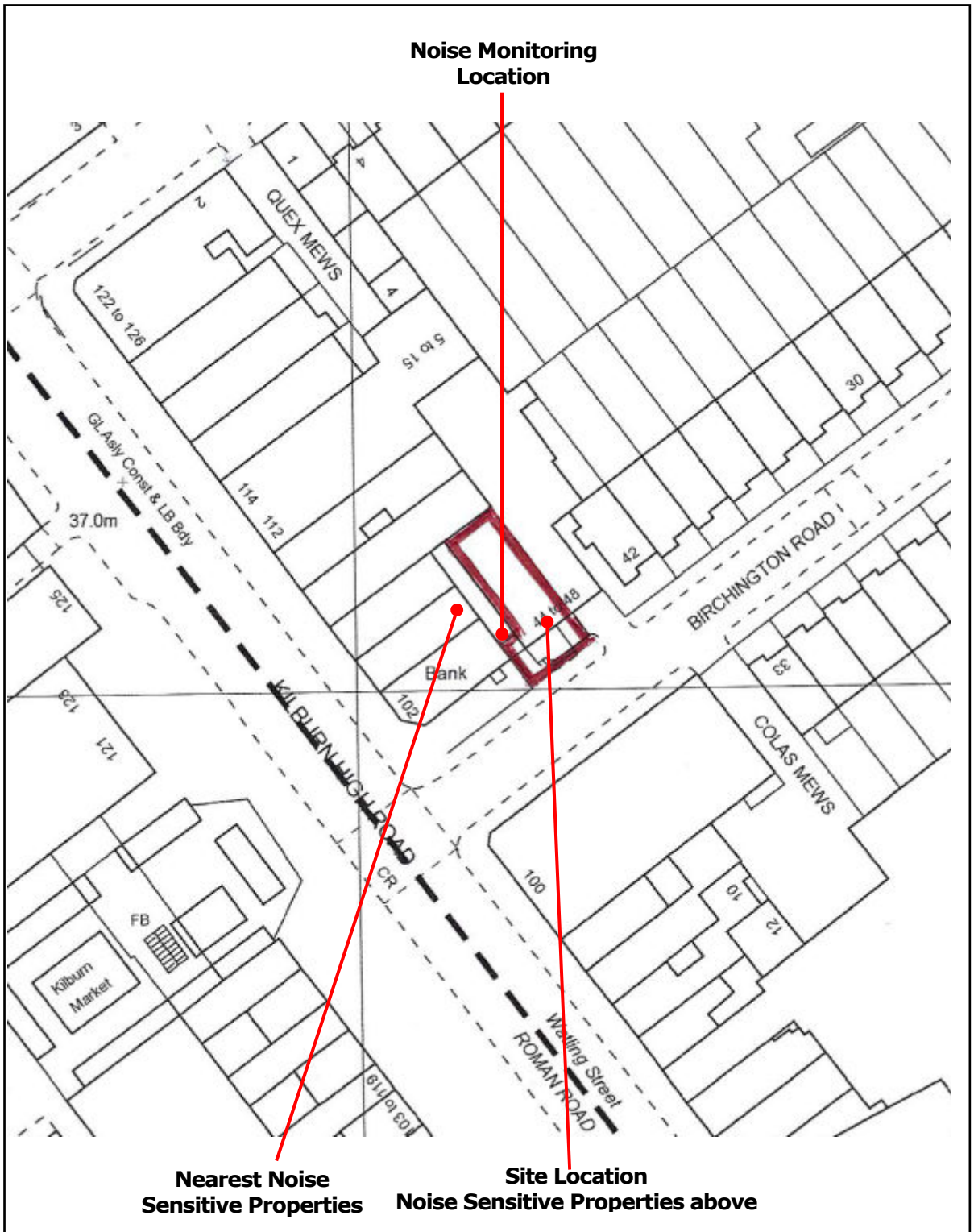
3. DEFRA, Noise Policy Statement for England, March 2010.

4. British Standards Institution. British Standard 4142: 1997 Rating Industrial Noise Affecting Mixed Residential and Industrial Areas.

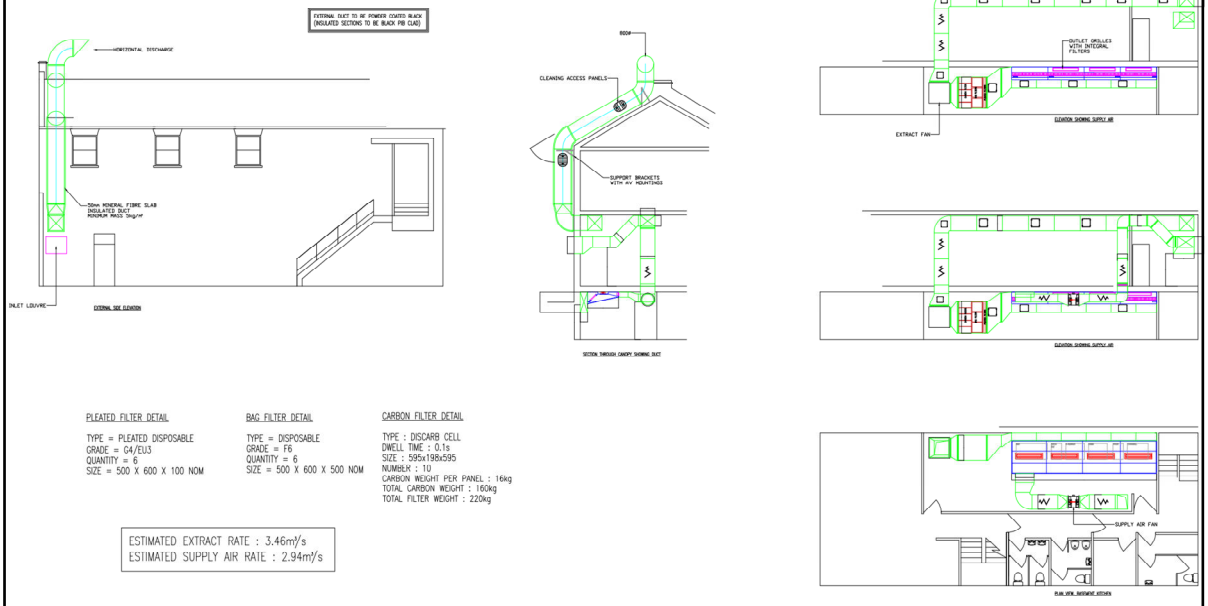
5. Camden Development Policies 2010-2025, Development Policy DP28 'Noise and Vibration'

6. British Standards Institution. British Standard 7445: 1991 'Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use'

7. The Building Regulations, Approved Document E – Resistance to the Passage of Sound, 2003.



Project: 46 Birchington Road, London	**Title:** Site Plan and Noise Measurement Location		24Acoustics
DWG No: Figure 1	**Scale:** N.T.S.	**Rev:** B	
Date: August 2014	**Drawn By:** CM	**Job No:** 4626-3	



PLEATED FILTER DETAIL

TYPE = PLEATED DISPOSABLE
GRADE = G4/EU3
QUANTITY = 6
SIZE = 500 X 600 X 100 NOM

BAG FILTER DETAIL

TYPE = DISPOSABLE
GRADE = F6
QUANTITY = 6
SIZE = 500 X 600 X 500 NOM

CARBON FILTER DETAIL

TYPE : DISCARB CELL
DWELL TIME : 0.1s
SIZE : 595x198x595
NUMBER : 10
CARBON WEIGHT PER PANEL : 16kg
TOTAL CARBON WEIGHT : 160kg
TOTAL FILTER WEIGHT : 220kg

ESTIMATED EXTRACT RATE : 3.46m³/s
ESTIMATED SUPPLY AIR RATE : 2.94m³/s

Project: 46 Birchington Road, London	**Title:** Proposed Plant Layout	
DWG No: Figure 2	**Scale:** N.T.S.	**Rev:** A
Date: August 2014	**Drawn By:** CM	**Job No:** 4626-3

APPENDIX A: ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 [1] as the " value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time internal, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

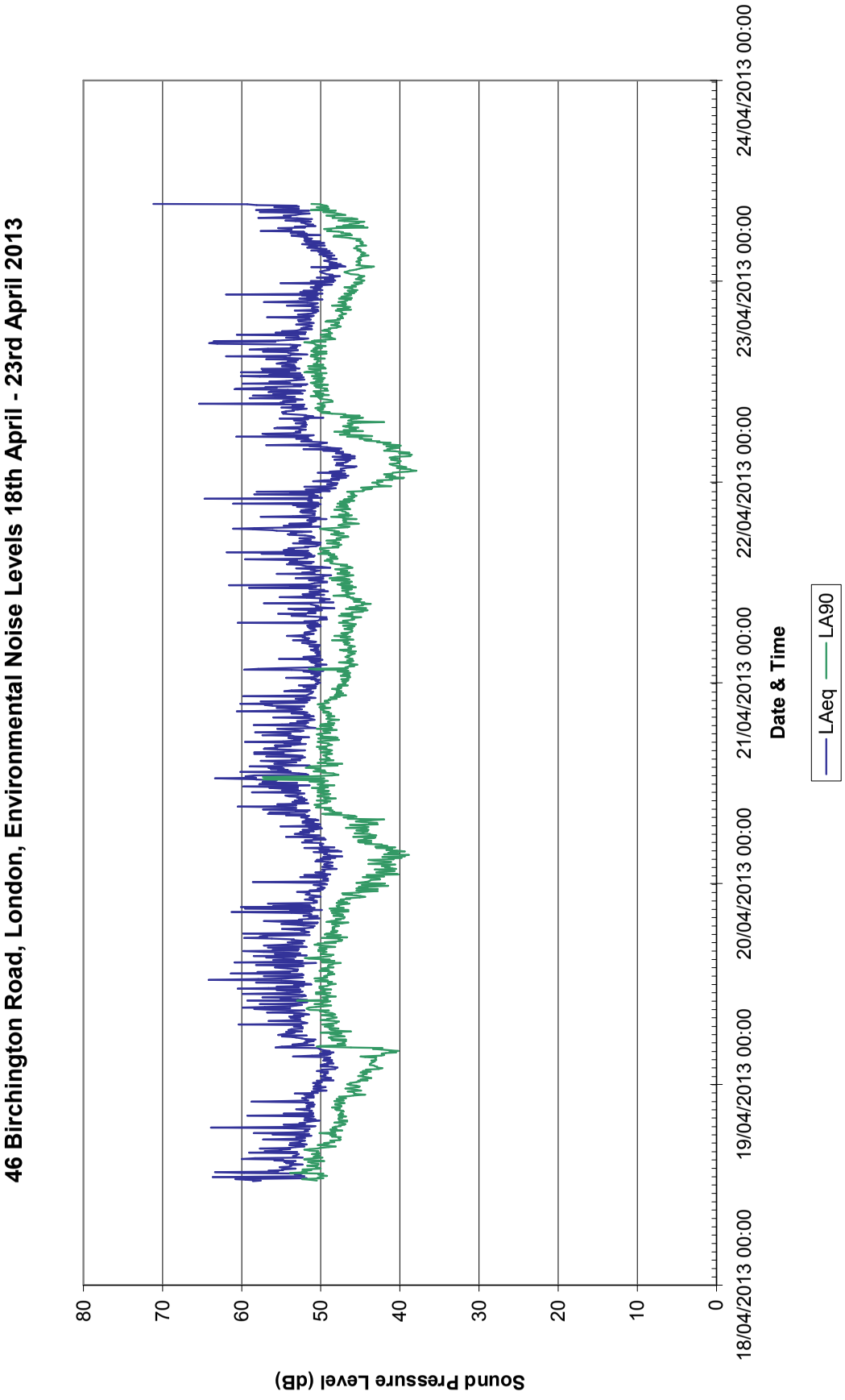
iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

APPENDIX B: MEASURED NOISE LEVELS



APPENDIX C: PLANT NOISE CALCULATIONS

Calculations of external plant noise to nearest residential window across the passageway at the rear of 104-106 Kilburn High Road:

MUB 100 630D4-L IE2 EXTRACT FAN									
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**dBA**
Outlet Lw A-weighted	60	78	82	84	83	80	75	67	**89**
A-weighted correction	26	16	9	3	0	-1	-1	1	
Outlet Lw linear	86	94	91	87	83	79	74	68	**89**
Attenuator Performance	-9	-24	-30	-29	-27	-28	-14	-9	
90 degree bend	0	0	-1	-2	-3	-3	-3	-3	
90 degree bend	0	0	-1	-2	-3	-3	-3	-3	
90 degree bend	0	0	-1	-2	-3	-3	-3	-3	
Discharge grille, end reflection	-6	-3	0	0	0	0	0	0	
Grille Lw	72	67	58	52	47	42	51	50	**58**
directivity correction	-1	0	-1	-1	-6	-9	-9	-9	
distance to window 7m	-17	-17	-17	-17	-17	-17	-17	-17	
hemispherical	-8	-8	-8	-8	-8	-8	-8	-8	
Lp at window - from Grille	46	42	32	26	16	8	17	16	**30**
Breakout Lw in duct	77	70	59	54	50	45	54	53	**61**
duct wall SRI, 5 kg/m2 lagging	-21	-21	-22	-21	-32	-45	-48	-44	
exposed duct surface area	4	4	4	4	4	4	4	4	
duct cross-section area	1	1	1	1	1	1	1	1	
Duct Breakout Lw	65	58	46	41	26	9	14	18	**45**
distance to window 2m	-6	-6	-6	-6	-6	-6	-6	-6	
hemispherical	-8	-8	-8	-8	-8	-8	-8	-8	
Lp at window - from breakout	51	44	32	27	12	-5	0	4	**31**
TCBTx2/4 560 SUPPLY AIR FAN									
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**dBA**
Inlet Lw A-weighted	57	79	83	86	89	84	78	72	**93**
A-weighted correction	26	16	9	3	0	-1	-1	1	
Inlet Lw linear	83	95	92	89	89	83	77	73	**93**
Attenuator Performance	-6	-25	-30	-31	-32	-29	-24	-22	
90 degree bend	0	0	-1	-2	-3	-3	-3	-3	
90 degree bend	0	0	-1	-2	-3	-3	-3	-3	
Inlet Louvre, end reflection	-6	-3	0	0	0	0	0	0	
Louvre Lw	72	68	59	54	51	48	47	45	**59**
directivity correction	0	1	1	0	0	-1	-1	-1	
distance to window 4.5m	-13	-13	-13	-13	-13	-13	-13	-13	
hemispherical	-8	-8	-8	-8	-8	-8	-8	-8	
Lp at window - from Louvre	51	47	39	33	30	26	25	23	**38**
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
TOTAL Plant Noise at Resi	55	50	40	35	31	27	26	24	**39**

Calculations of external plant noise to nearest residential window of flats above on the first floor of the building:

MUB 100 630D4-L IE2 EXTRACT FAN									
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**dBA**
Outlet Lw A-weighted	60	78	82	84	83	80	75	67	**89**
A-weighted correction	26	16	9	3	0	-1	-1	1	
Outlet Lw linear	86	94	91	87	83	79	74	68	**89**
Attenuator Performance	-9	-24	-30	-29	-27	-28	-14	-9	
90 degree bend	0	0	-1	-2	-3	-3	-3	-3	
90 degree bend	0	0	-1	-2	-3	-3	-3	-3	
90 degree bend	0	0	-1	-2	-3	-3	-3	-3	
Discharge grille, end reflection	-6	-3	0	0	0	0	0	0	
Grille Lw	72	67	58	52	47	42	51	50	**58**
directivity correction	-1	0	-1	-1	-6	-9	-9	-9	
distance to window 5m	-14	-14	-14	-14	-14	-14	-14	-14	
hemispherical	-8	-8	-8	-8	-8	-8	-8	-8	
Minimum screening - Roof edge	-10	-10	-10	-10	-10	-10	-10	-10	
Lp at window - from Grille	39	35	25	18	9	1	10	9	**23**
Breakout Lw in duct	77	70	59	54	50	45	54	53	**61**
duct wall SRI, 5 kg/m2 lagging	-21	-21	-22	-21	-32	-45	-48	-44	
exposed duct surface area	4	4	4	4	4	4	4	4	
duct cross-section area	1	1	1	1	1	1	1	1	
Duct Breakout Lw	65	58	46	41	26	9	14	18	**45**
distance to window 1.5m	-4	-4	-4	-4	-4	-4	-4	-4	
hemispherical	-8	-8	-8	-8	-8	-8	-8	-8	
Lp at window - from breakout	54	46	35	30	15	-3	3	6	**34**
TCBTx2/4 560 SUPPLY AIR FAN									
	63Hz	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**dBA**
Inlet Lw A-weighted	57	79	83	86	89	84	78	72	**93**
A-weighted correction	26	16	9	3	0	-1	-1	1	
Inlet Lw linear	83	95	92	89	89	83	77	73	**93**
Attenuator Performance	-6	-25	-30	-31	-32	-29	-24	-22	
90 degree bend	0	0	-1	-2	-3	-3	-3	-3	
90 degree bend	0	0	-1	-2	-3	-3	-3	-3	
Inlet Louvre, end reflection	-6	-3	0	0	0	0	0	0	
Louvre Lw	72	68	59	54	51	48	47	45	**59**
directivity correction	0	0	0	-1	-5	-8	-8	-8	
distance to window 4m	-12	-12	-12	-12	-12	-12	-12	-12	
hemispherical	-8	-8	-8	-8	-8	-8	-8	-8	
Lp at window - from Louvre	52	48	39	34	27	20	19	17	**37**
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
TOTAL Plant Noise at Resi	56	50	41	35	27	21	20	18	**39**

APPENDIX D: SOUND INSULATION TEST RESULTS

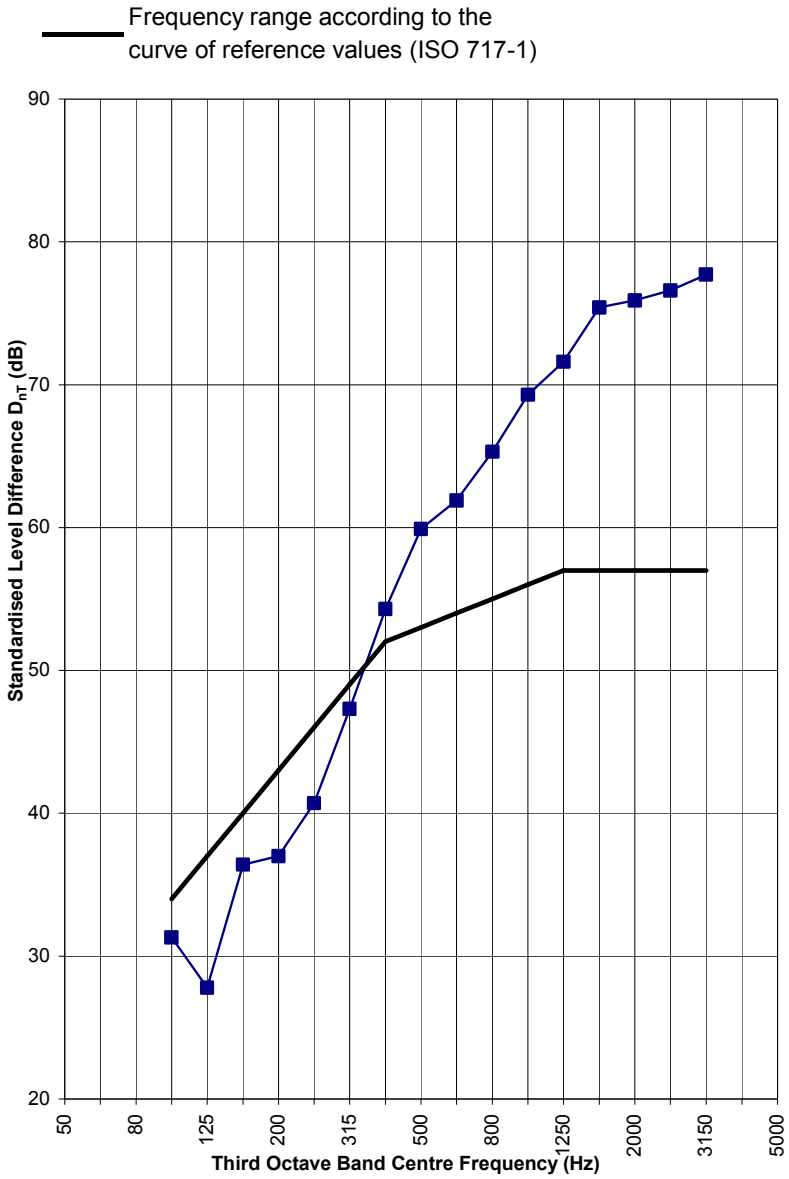
Standardised level difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client: Ben Baker
Date of test: 23rd April 2013

Source Room: Shop Floor
Receiving Room: Flat B Living Room

Construction: Existing Timber Floor Construction
Suspended Grid Ceiling

Frequency f Hz	D_{nT} (1/3-octave) dB	
50	-	
63	-	
80	-	
100	31.3	
125	27.8	
160	36.4	
200	37.0	
250	40.7	
315	47.3	
400	54.3	
500	59.9	
630	61.9	
800	65.3	
1000	69.3	*
1250	71.6	*
1600	75.4	*
2000	75.9	*
2500	76.6	*
3150	77.7	*
4000	-	
5000	-	



Rating according to ISO 717-1

$D_{nT,w}(C_{tr})$ =	53 (-9) dB	$D_{nT,w} + (C_{tr})$ =	**44 dB**

* Indicative that receiving room level is within 6 dB of background level

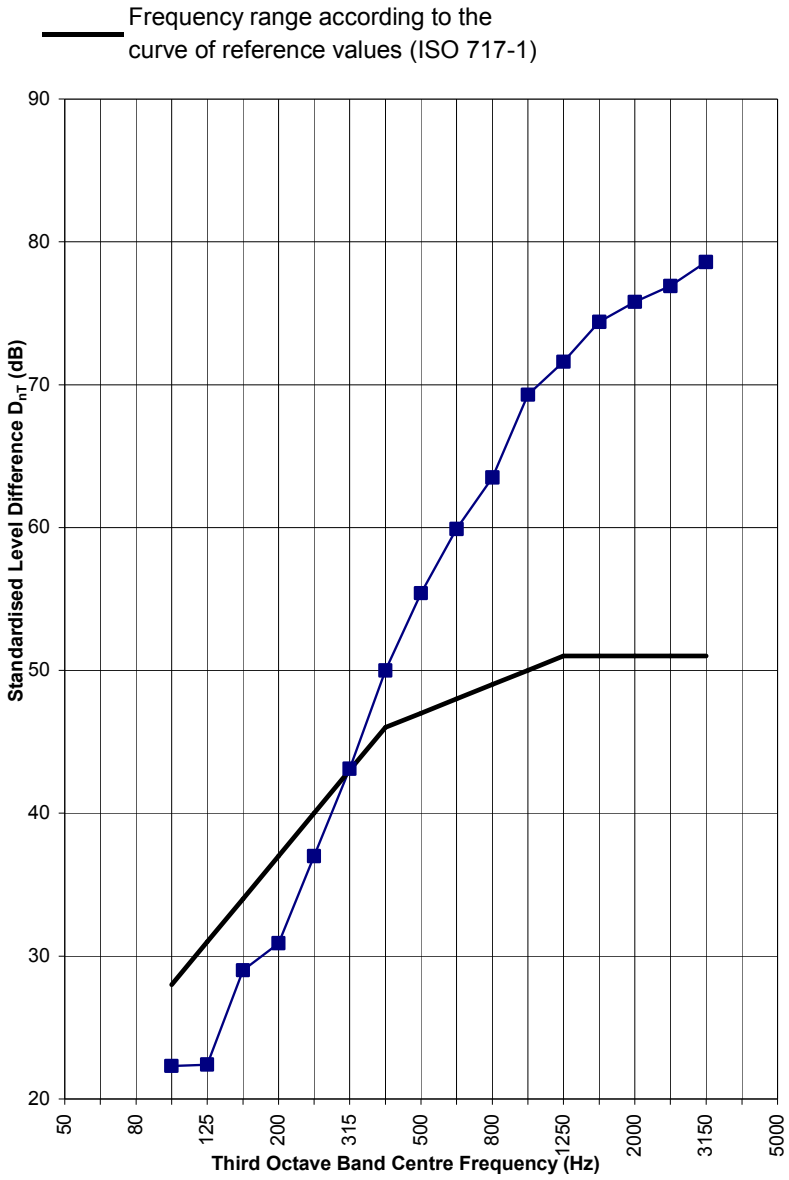
Standardised level difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client: Ben Baker
Date of test: 23rd April 2013

Source Room: Shop Floor
Receiving Room: Flat B Bedroom 1

Construction: Existing Timber Floor Construction
Suspended Grid Ceiling

Frequency f Hz	D_{nT} (1/3-octave) dB	
50	-	
63	-	
80	-	
100	22.3	
125	22.4	
160	29.0	
200	30.9	
250	37.0	
315	43.1	
400	50.0	
500	55.4	
630	59.9	
800	63.5	
1000	69.3	*
1250	71.6	*
1600	74.4	*
2000	75.8	*
2500	76.9	*
3150	78.6	*
4000	-	
5000	-	



Rating according to ISO 717-1

$D_{nT,w}(C_{tr})$ =	47 (-9) dB	$D_{nT,w} + (C_{tr})$ =	**38 dB**

* Indicative that receiving room level is within 6 dB of background level

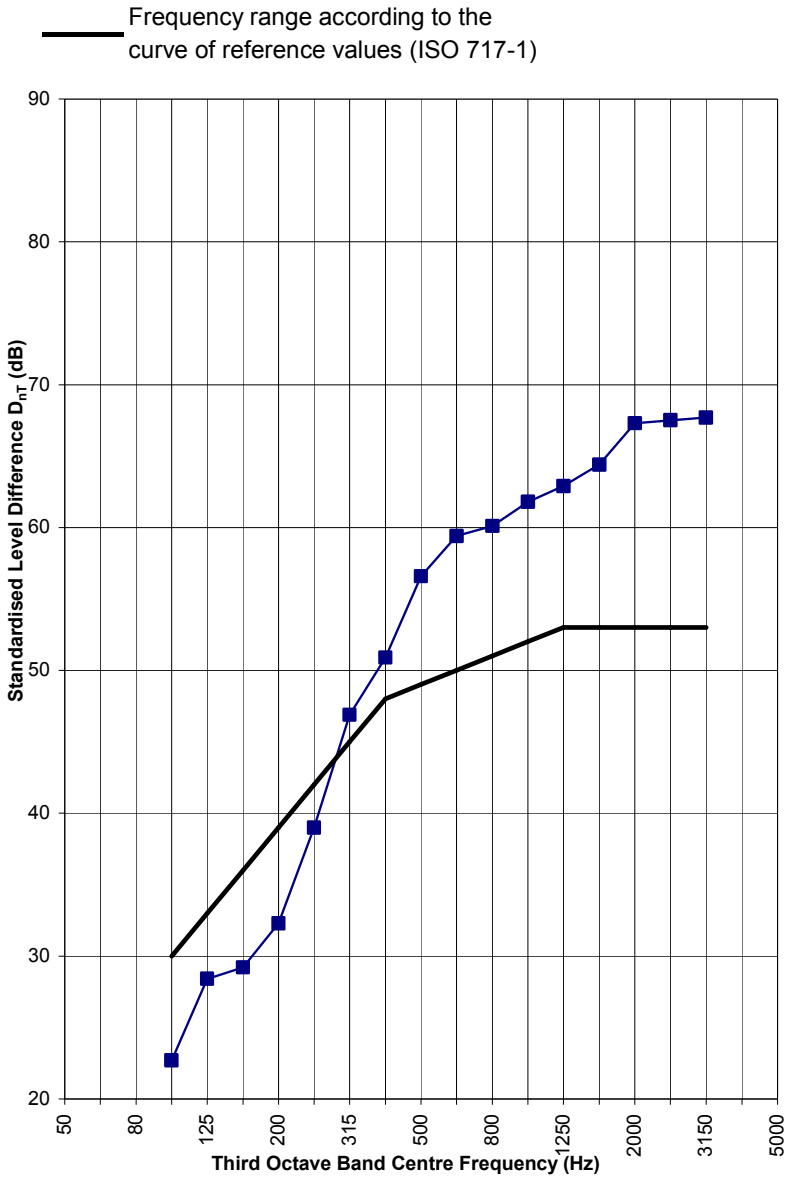
Standardised level difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client: Ben Baker
Date of test: 23rd April 2013

Source Room: Shop Floor
Receiving Room: Flat A Living Room

Construction: Existing Timber Floor Construction
Suspended Grid Ceiling

Frequency f Hz	D_{nT} (1/3-octave) dB	
50	-	
63	-	
80	-	
100	22.7	
125	28.4	
160	29.2	
200	32.3	
250	39.0	
315	46.9	
400	50.9	
500	56.6	*
630	59.4	*
800	60.1	*
1000	61.8	*
1250	62.9	*
1600	64.4	*
2000	67.3	*
2500	67.5	*
3150	67.7	
4000	-	
5000	-	



Rating according to ISO 717-1

$D_{nT,w}(C_{tr})$ =	49 (-9) dB	$D_{nT,w} + (C_{tr})$ =	**40 dB**

* Indicative that receiving room level is within 6 dB of background level

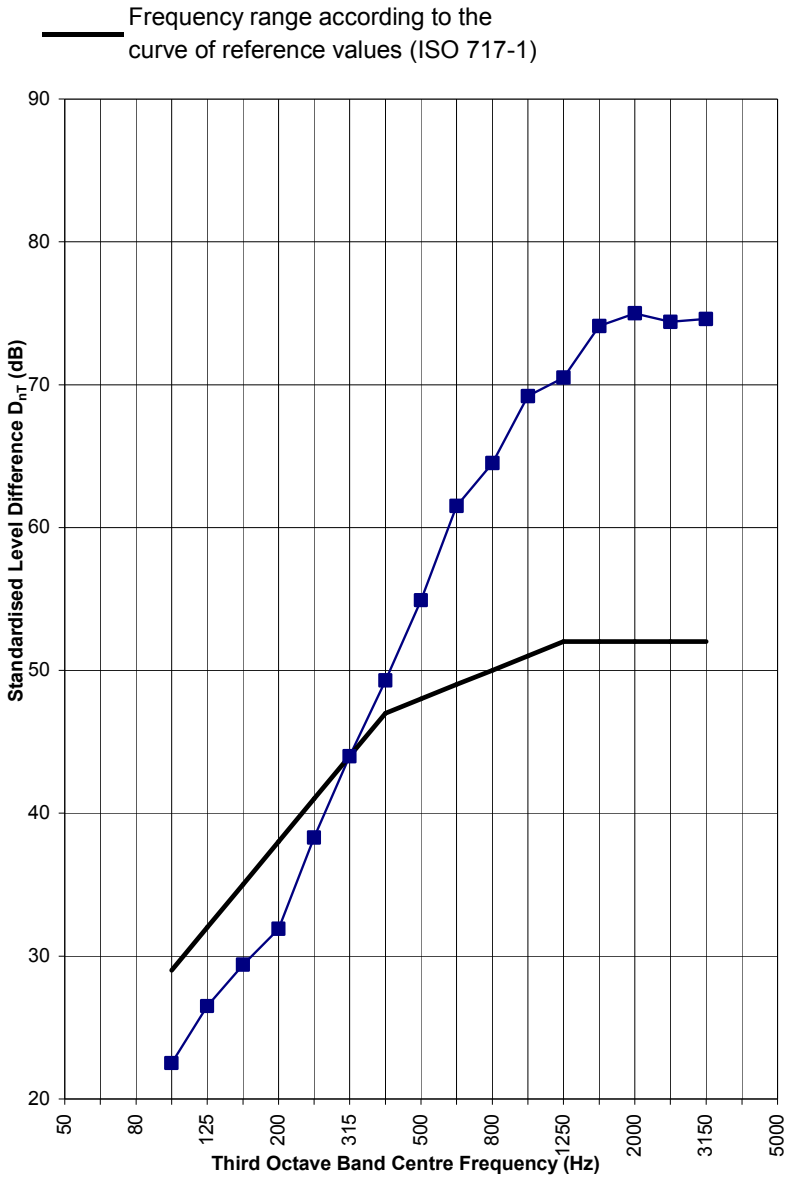
Standardised level difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Client: Ben Baker
Date of test: 23rd April 2013

Source Room: Shop Floor
Receiving Room: Flat A Bedroom 1

Construction: Existing Timber Floor Construction
Suspended Grid Ceiling

Frequency f Hz	D_{nT} (1/3-octave) dB	
50	-	
63	-	
80	-	
100	22.5	
125	26.5	
160	29.4	
200	31.9	
250	38.3	
315	44.0	
400	49.3	
500	54.9	
630	61.5	
800	64.5	*
1000	69.2	*
1250	70.5	*
1600	74.1	*
2000	75.0	*
2500	74.4	*
3150	74.6	*
4000	-	
5000	-	



Rating according to ISO 717-1

$D_{nT,w}(C_{tr})$ =	48 (-9) dB	$D_{nT,w} + (C_{tr})$ =	**39 dB**

* Indicative that receiving room level is within 6 dB of background level