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42 HAMPSTEAD HIGH STREET, LONDON

NOISE IMPACT ASSESSMENT REPORT

Report 9143.NIA.01 Rev.B

For:

Trevor Sorbie,

42 Hampstead High Street,

London,

NW3 1QE

Site Address	Report Date	Revision History
42 Hampstead High Street, London	19/06/2012	Rev.A – 22 October 2012 Rev.B – 14 January 2013

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1.0 INTRODUCTION

KP Acoustics Ltd, Britannia House, 11 Glenthorne Road, London, W6 0LH, has been commissioned by Trevor Sorbie, 42 Hampstead High Street, London, NW3 1QE, to undertake an environmental noise survey at 42 Hampstead High Street, London. The background noise levels measured will be used to determine daytime and night-time noise emission criteria for the proposed relocation of four air-conditioning units in agreement with the planning requirements of Camden Council.

This report presents the overall methodology and results from the environmental survey followed by calculations to demonstrate the feasibility of the plant installation to satisfy the emissions criterion at the closest noise-sensitive receiver and outline mitigation measures, as appropriate.

'The report has been prepared taking into account the proposals for the creation of a one bedroom maisonette on the first and second floors at No 41 Hampstead High Street, under planning permission 2012/3554/P as amended by 2012/6249/P.'

2.0 ENVIRONMENTAL NOISE SURVEY AND EQUIPMENT

2.1 Procedure

Automated noise monitoring was undertaken at the position shown in Site Plan 9143.SP1. The choice of this 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. The duration of the survey was between 15:23 on 14/06/2012 and 23:00 on 15/06/2012.

Initial inspection of the site revealed that the background noise profile at the monitoring location was dominated by road traffic noise occurring from Hampstead High Street.

The weather during the course of the survey was generally dry, and with wind speeds within acceptable tolerances and therefore suitable for the measurement of environmental noise. The measurement procedure generally complied with BS7445:1991 "*Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*".

2.2 Equipment

The equipment calibration was verified before and after the survey and no calibration irregularities were observed.

The equipment used was as follows.

- Svantek Type 957 Class 1 Sound Level Meter
- B&K Type 4231 Class 1 Calibrator

3.0 RESULTS

The results from the continuous noise monitoring are shown as a time history of L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} averaged over 5 minute sample periods in Figure 9143.TH1.

Minimum background noise levels are shown in Table 3.1.

	Minimum background noise level $L_{A90:\ 5min}$ dB(A)
Daytime (07:00-23:00)	50
Night-time (23:00-07:00)	45
Proposed Opening Hours (09:00-20:00)	55

Table 3.1: Minimum measured background noise levels

4.0 NOISE CRITERIA

The criterion of Camden Council for noise emissions of new plant in this instance is as follows:

"The Council considers that for new developments involving noisy plant/equipment or other uses, design measures should be taken to ensure that levels predicted at a point 1 metre external to sensitive facades are at least 5dB(A) less than the existing background measurement (LA90) when the equipment is in operation. Where it is anticipated that equipment will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses in the noise (bangs, clicks, clatters, thumps), special attention should be given to reducing the noise levels at any sensitive facade by at least 10dB(A) below the LA90 level."

We therefore propose to set the noise criteria as shown in Table 4.1 in order to comply with the above requirement.

	Daytime (07:00 to 23:00)	**Night-time (07:00 to 23:00)**	**Proposed Opening Hours (09:00 to 20:00)**
Noise criterion at nearest residential receiver (10dB below minimum L_{A90})	40 dB(A)	34 dB(A)	45 dB(A)

Table 4.1: Proposed Noise Emissions Criteria

The proposed air conditioning unit will only be used during the premises opening hours. Due to these opening times varying from day to day, the longest opening hours during the week of 09:00-20:00 will be used to create a more robust report.

5.0 DISCUSSION

The proposed location of the four air conditioning units is as shown in indicative site plan 9143.SP1 Rev.A. It is currently proposed that the units are relocated from their current place on the side façade of the premises within an alleyway, towards the side elevation of a lightwell wall at the top level of the building. The closest noise sensitive receiver would be a window within the alleyway, which would be completely screened acoustically from the relocated units, due to the building envelope.

It is understood that the plant installation comprises of four new air conditioning units, selected as follows:

- 1 No. Fujitsu Inverter Model AOY54L unit
- 2 No. Fujitsu Inverter Model AOYA24L units
- 1 No. Fujitsu Inverter Model AOYG24LAT3 unit

The sound pressure levels as provided by the manufacturer for the unit are shown in Table 5.1*.

	Sound Pressure Level (dB) in each Frequency Band (at 1m)							
Unit	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**
Fujitsu Inverter AOY54L Unit*	60	56	52	51	49	44	41	35
Fujitsu Inverter AOYA24L Unit*	68	57	51	52	48	44	40	33
Fujitsu Inverter AOYG24LAT3 Unit*	58	54	45	46	34	35	34	30

Table 5.1 Manufacturer's Sound Pressure Level at 1m

*** worst case operational modes have been used in order to provide a more robust assessment**

5.1 Objective overview

Taking all acoustic corrections into consideration, including distance corrections, the noise levels expected at the closest residential window would be as shown in Table 5.2. Detailed calculations are shown in Appendix B Rev.A.

Receiver - Nearest Noise Sensitive Window	**Criterion**	**Noise Level at Receiver**
Operating hours	45 dB(A)	40 dB(A)

Table 5.2: Predicted noise levels and criterion at nearest noise sensitive location

As shown in Appendix B and Table 5.2, transmission of noise to the nearest sensitive windows due to the effects of the plant unit installation fully satisfies the emissions criteria set by Camden Council, without any mitigation measures in place.

It is the professional opinion of KP Acoustics that this level is not going to pose any negative impact on the amenity of nearby residential receivers. Furthermore, the value of 40dB(A) is to be considered outside of the building. Windows may be closed or partially closed leading to further attenuation.

Further calculations have been undertaken to assess whether the noise emissions from the proposed plant unit installation would be expected to meet the recognised British Standard recommendations, in order to further ensure the amenity of nearby noise sensitive receivers.

British Standard 8233:1999 '*Sound insulation and noise reduction for buildings – Code of Practise*' gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS8233:1999 recommends 30dB(A) as being 'Good' internal resting/sleeping conditions.

With calculated external levels of 40 dB(A), the residential window itself would need to provide at least 10dB attenuation in order for 'Good' conditions to be achieved. According to BS8233:1999, even a partially open window offers 10-15dB attenuation, thus leading to an acceptable interior noise level that meets the criterion.

Receiver	**'Good' Conditions Design Range – *For resting/sleeping conditions in a bedroom, in BS8233:1999***	**Noise Level at Receiver (due to plant installation)**
Inside Nearest Residential Space	30-35 dB(A)	30 dB(A)

Table 5.3: Noise levels and criteria inside nearest residential space

Predicted levels are shown in Table 5.3, with detailed calculations shown in Appendix B. It can therefore be stated that, as well as complying with the requirements of Camden Council, the emissions from the air-conditioning units would be expected to meet the most stringent recommendations of the relevant British Standard, even with neighbouring windows partially open.

6.0 CONCLUSION

An environmental noise impact survey has been undertaken at 42 Hampstead High Street, London, by KP Acoustics Ltd between 14/06/2012 and 15/06/2012. The results of the survey have enabled criteria to be set for noise emissions. Using manufacturer noise data, noise levels are predicted at the nearby noise sensitive receivers for compliance with current requirements.

Calculations show that noise emissions from the proposed unit installation would meet the requirements of Camden Council.

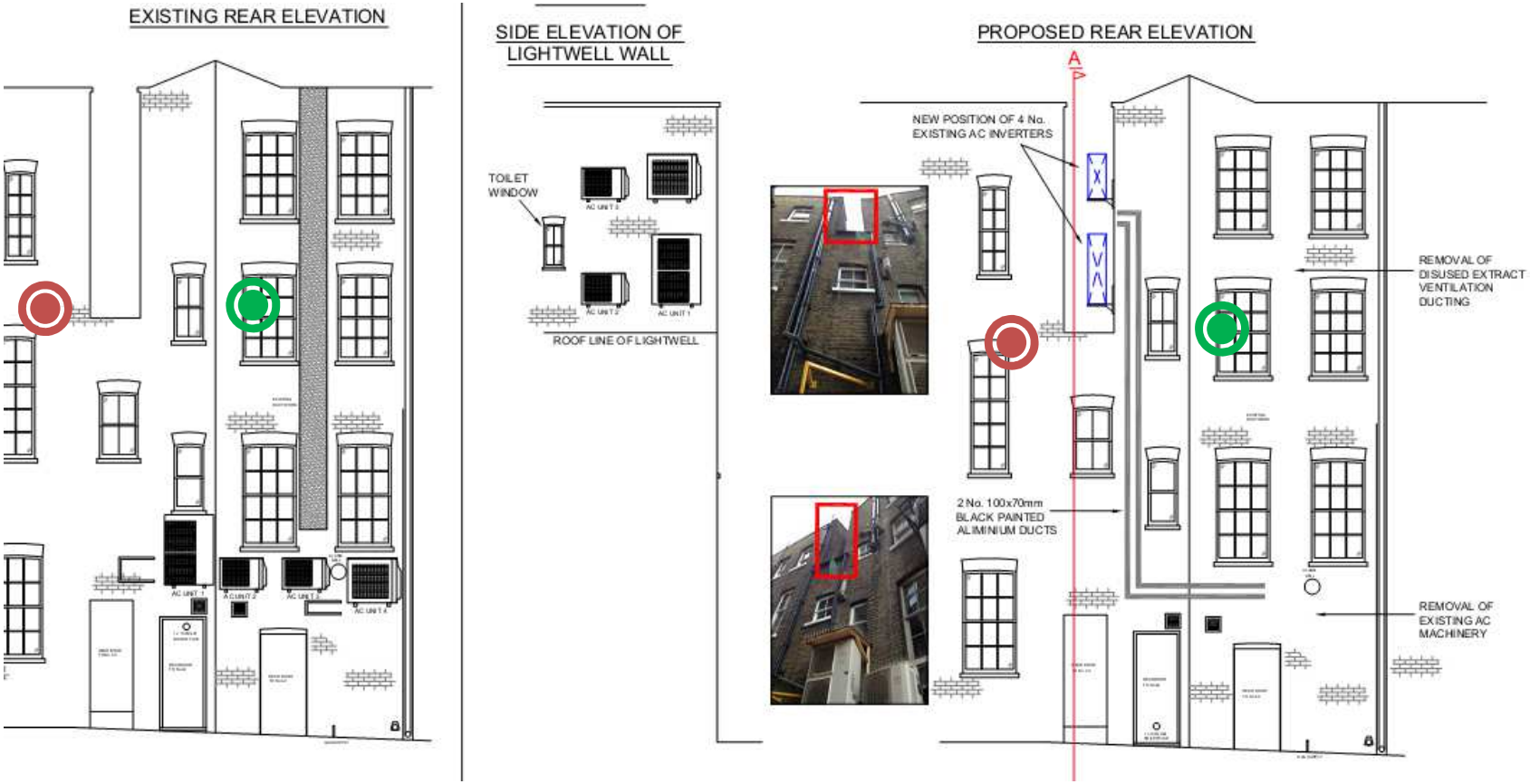
Further calculations have been undertaken with regards to the relevant British Standard and it has been ensured that the amenity of nearby residential receivers will be protected.

Report by

Kyriakos Papanagiotou

Director

KP Acoustics



Title:

Indicative site plan showing noise monitoring position

Date: 22 October 2012

FIGURE 9143.SP1 Rev.A

KP acoustics

42 Hampstead High Street, London
Environmental Noise Time History
14th June to 15th June 2012

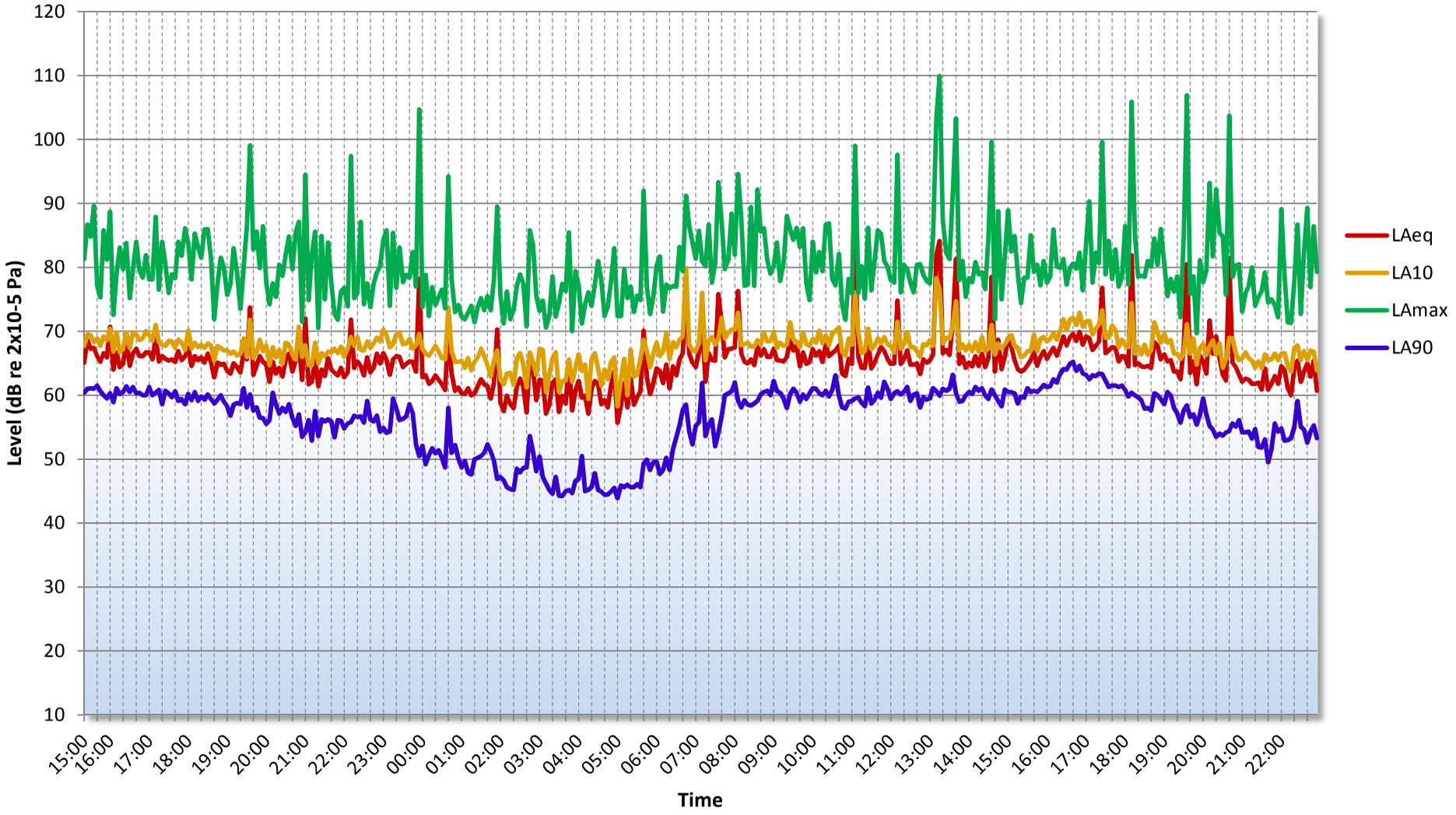


Figure 9143.TH1

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 Rev.A

42 Hampstead High Street, London

AIR CONDITIONING UNITS EMISSIONS CALCULATION

Source: Fujitsu Air Conditioning Units	*Frequency, Hz*								
Receiver: Nearest Residential Window	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Manufacturer's sound pressure level at 1m									
1 No. Fujitsu Inverter AOY54L Unit	60	56	52	51	49	44	41	35	
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Distance correction (3m), dB	-10	-10	-10	-10	-10	-10	-10	-10	
Attenuation due to screening from building envelope	-9	-11	-13	-16	-17	-17	-17	-17	
2 No. Fujitsu Inverter AOYA24L Unit	68	57	51	52	48	44	40	33	
Correction for 2 units	3	3	3	3	3	3	3	3	
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Distance correction (3m), dB	-10	-10	-10	-10	-10	-10	-10	-10	
Attenuation due to screening from building envelope	-9	-11	-13	-16	-17	-17	-17	-17	
1 No. Fujitsu Inverter AOYG24LAT3 Unit	58	54	45	46	34	35	34	30	
Correction for reflections, dB	3	3	3	3	3	3	3	3	
Distance correction (3m), dB	-10	-10	-10	-10	-10	-10	-10	-10	
Attenuation due to screening from building envelope	-9	-11	-13	-16	-17	-17	-17	-17	
Sound pressure level 1m from nearest residential receiver	**56**	**44**	**45**	**36**	**29**	**25**	**21**	**15**	**40**

Design Criterion	**45**

Receiver: Inside Nearest Residential Window

	Frequency, Hz								
Source: Mitsubishi Unit	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
Sound pressure level outside window	56	44	45	36	29	25	21	15	40
Attenuation from partially open window, dB	-10	-10	-10	-10	-10	-10	-10	-10	
Sound pressure level inside nearest noise sensitive window	**46**	**34**	**35**	**26**	**19**	**15**	**11**	**5**	**35**

Design Range	**30-35**