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83 Belsize Park Gardens,
London

6 April 2023

18275-NIA-01-RevA

Project Number
18275

Issued For
Gaby & Stuart Riley



EXECUTIVE SUMMARY

This noise impact assessment has been undertaken in order to assess a proposed plant installation for residential use at 83 Belsize Park Gardens, London.

The proposed plant installation comprises 1 No. Fujitsu Condenser Unit.

A background noise survey has been undertaken as detailed in the report, in order to determine an appropriate noise emission criterion, in accordance with the requirements of Camden London Borough Council.

Calculations were undertaken for the nearest identified receivers, identified as both a window that is currently proposed to serve a Fine Arts Sixth Form College, and the rear first floor window of no. 85 Belsize Park Gardens. It should be noted that if there are closer receivers that Clement Acoustics is not aware of, a reassessment will be necessary, and this should therefore be confirmed by the Client.

It has been demonstrated that compliance with the established criterion is feasible, dependent on the following material considerations:

- The plant could be in use at any time over a 24 hour period
- The noise emissions data for the proposed unit as obtained from available manufacturer information
- Plant and receiver locations are as established in this report and marked on the attached site plan
- Mitigation is applied as recommended in this report, in the form of a louvred enclosure

If there is any deviation from the above, Clement Acoustics must be informed, in order to establish whether a reassessment is necessary.

Clement Acoustics has used all reasonable skill and professional judgement when preparing this report. The report relies on the information as provided to us at the time of writing and the assumptions as made in our assessment.

This report is designed to be suitable to discharge typical plant noise planning conditions, as per our original scope of work. The report should not be relied upon for further reasons, such as the detailed design of mitigation measures.

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| Appendix B1-2-RevA | Acoustic Calculations |

| Issue | Date of Issue | Author | Reviewed | Authorised |
|-------|---------------|---|--|---|
| 0 | 05/04/23 |  |  |  |
| | | Dan Hagan Consultant BSc (Hons) AMIOA | Matthew Markwick Principal Consultant BSc (Hons) MSc MIOA | Andrew Thomas Principal Consultant BSc (Hons) MIOA |
| A | 06/04/23 |  |  |  |
| | | Dan Hagan Consultant BSc (Hons) AMIOA | Matthew Markwick Principal Consultant BSc (Hons) MSc MIOA | Andrew Thomas Principal Consultant BSc (Hons) MIOA |

| Issue | Comment |
|-------|---|
| 0 | First Issue |
| A | Corrected proposed unit and minor wording amendment |

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Gaby & Stuart Riley to measure existing background noise levels at 83 Belsize Park Gardens, London. Measured noise levels have been used to determine noise emissions criteria for a proposed plant installation in agreement with the planning requirements of the London Borough of Camden.

This report presents the results of the environmental survey followed by noise impact calculations and outlines any necessary mitigation measures.

An acoustic terminology glossary is provided in Appendix A.

2.0 SITE DESCRIPTION

83 Belsize Park Gardens is a semi-detached dwelling located in a predominantly residential area, with Belsize Park Gardens located to the north, a Fine Arts Sixth Form College to the west, residential dwellings to the east and associated gardens to the south.

Current proposals are to install a single external condenser unit in the rear garden of the property.

Both a future-proposed sixth form window and an existing residential window have been identified as the nearest affected receivers. This nearest noise sensitive receivers were identified through observations on-site. If there are any receivers closer to that identified within this report then a further assessment will need to be carried out. Therefore, the closest noise sensitive receiver should be confirmed by the client before the plant is installed or any noise mitigation measures are implemented.

Locations are shown in attached site plan 18275-SP1.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Unattended Noise Survey Procedure

Measurements were undertaken at one position as shown on indicative site drawing 18275-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest affected receiver.

The surroundings and position used for the monitoring location are described in Table 3.1.

| Position No. | Description |
|--------------|---|
| 1 | The microphone was mounted on a tripod at least 1.5 m above the ground in the rear garden. The microphone was positioned Approximately 3.5 m in front of the nearest boundary wall. [1] |

Table 3.1 Description of unattended monitoring locations

Note [1]: The position was considered to be free-field according to guidance found in BS 4142: 2014, and a correction for reflections has therefore not been applied.

Continuous automated monitoring was undertaken for the duration of the survey between 14:50 on 10 March 2023 and 06:00 on 12 March 2023.

The measurement procedure generally complied with BS 7445: 1991: ‘Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use’.

3.2 Weather Conditions

Weather conditions were observed and noted during the set-up and collection of the monitoring equipment.

Wind speeds and temperatures were measured using a digital anemometer and thermometer, while other weather elements were determined through subjective observations.

The noted weather conditions are summarised in Table 3.2.

| Position No. | Wind Speed | Wind Direction | Temperature | Cloud Cover | Comments |
|--|------------|----------------|-------------|-------------|---|
| Meter Set-Up 10 th March 2023 | | | | | |
| 1 | 3.5 m/s | NW | 6 °c | 40 % | Comments on any rain or other weather of note |
| Meter Collection 13 th March 2023 | | | | | |
| 1 | 9 m/s [1] | SW | 13 °c | 20 % | Comments on any rain or other weather of note |

Table 3.2 Noted weather conditions during surveys

[1] It should be noted that although conditions were windy on the collection of our equipment, the set noise criterion was based upon a period when wind speed were significantly lower.

It is considered that the weather conditions were suitable for the measurement of environmental noise.

3.3 Equipment

The equipment calibration was verified, by means of a field verification check, before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 957 Class 1 Sound Level Meter
- Rion Type NC-74 Class 1 Calibrator

4.0 RESULTS

4.1 Unattended Noise Survey Results

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured at the location shown in site drawing 18275-SP1.

Measured noise levels are shown as a time history in Figure 18275-TH1, with average ambient and typical background noise levels summarised in Table 4.1.

| Position | Time Period | Average ambient noise level | Typical background noise level |
|----------|-------------------------------|-----------------------------|--------------------------------|
| | | $L_{Aeq: T}$, dB | $L_{A90: 5min}$, dB |
| 1 | Daytime (07:00 - 23:00) | 43 | 38 |
| | Night-time (23:00 - 07:00) | 39 | 34 |

Table 4.1 Average ambient and typical background noise levels

5.0 NOISE CRITERIA

5.1 Relevant Local Policy

The assessment and recommendations in this report have been undertaken in accordance with Policy D14 of the London Plan 2021, which contains the following relevant sections:

“D14. In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

5) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses”.

5.2 Local Authority Criteria

The Camden London Borough Council general criteria for noise emissions, as stated in the ‘Camden Local Plan (2017)’ are as follows:

“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).”

Alongside the above, it is worth noting that although the above criteria may be strict considering the sixth form window not being a residential dwelling, a robust assessment is provided and therefore ensures that any future students are not disturbed by the proposed noise source when classroom activities are undertaken.

It is understood that the proposed plant unit will be for residential use and could therefore be operational at all times.

The proposed plant is not expected to present any tonal element therefore a rating level of 10 dB below background is considered appropriate.

Based on the results of the environmental noise survey and requirements of the London Borough of Camden, Table 5.1 presents the proposed plant noise emission criteria to be achieved at 1 m from the nearest noise sensitive receiver:

| Period | Plant Noise Emission Limit $L_{Aeq,T}$, dB |
|-------------------------------|---|
| Daytime (07:00 - 23:00) | 28 |
| Night-time (23:00 - 07:00) | 24 |

Table 5.1 Plant noise emission limits

6.0 PLANT NOISE IMPACT ASSESSMENT

6.1 Proposed Installation

The proposed plant installation comprises 1 No. Fujitsu WOYK160LCTA Condenser Unit.

Noise emissions for the proposed plant unit, as provided by the manufacturer, are shown in Table 6.1. Loudest modes of operation have been used in order to present a robust worst-case assessment.

| Unit | Sound Pressure Level (at 1 m, dB) in each Frequency Band, Hz | | | | | | | | |
|---------------------|--|-----|-----|-----|----|----|----|----|-------|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | dB(A) |
| Fujitsu WOYK160LCTA | 62 | 60 | 58 | 55 | 52 | 48 | 44 | 37 | 57 |

Table 6.1 Manufacturer provided noise emissions levels

The proposed plant location is in the rear garden of 83 Belsize Park Gardens, which is shown on indicative site plan 18275-SP1.

6.2 Proposed Mitigation Measures

In order to meet the proposed criteria stated in Section 5.0, it is recommended that an enclosure is installed around the plant. The enclosure should provide sufficient attenuation to achieve a maximum sound pressure level of 47 dB(A) when measured at 1 m in all directions.

Based on the information provided, an enclosure meeting the sound reduction indices as stated in Table 6.2 should be suitable to achieve this.

| Mitigation | Required Attenuation (dB) in each Frequency Band, Hz | | | | | | | |
|-------------------|--|-----|-----|-----|----|----|----|----|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| Louvred Enclosure | 4 | 6 | 9 | 19 | 20 | 20 | 20 | 20 |

Table 6.2 Required attenuation from mitigation

6.3 Noise Impact Assessment

The closest receivers have been identified as two nearby windows. One is a window overlooking the garden, which is believed will eventually serve a sixth form classroom, whereas the other window is of 85 Belsize Park Gardens.

Due to the proximity of the proposed plant unit and existing boundary wall, screening of the proposed sixth form window is provided by the boundary wall, whereas the rear first floor window of 85 Belsize Park Gardens has direct line of sight to the unit.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.3. Detailed calculations are shown in Appendix B.

| Receiver | Design Criterion | Noise Level at Receiver (due to proposed plant) |
|-------------------------|------------------|---|
| Sixth Form Classroom | 24 dB(A) | 22 dB(A) |
| 85 Belsize Park Gardens | | 24 dB(A) |

Table 6.3 Noise levels and project criterion at noise sensitive receivers

As presented in Table 6.3 and Appendix B, the proposed plant installation with acoustic enclosure would be expected to meet the requirements of the proposed criteria.

6.4 British Standard Requirements

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

British Standard 8233: 2014 ‘Guidance on sound insulation and noise reduction for buildings’ gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS 8233: 2014 recommends 30 dB(A) as being acceptable internal sleeping conditions during night-time.

With loudest external levels of 24 dB(A), acceptable internal conditions would be met without taking the attenuation of the window itself into consideration. According to BS 8233: 2014, a typical building facade with a partially open window offers 15 dB attenuation.

It can therefore be predicted that, in addition to meeting the requirements of the set criteria, the emissions from the proposed plant would be expected to meet the most stringent recommendations of the relevant British Standard, with neighbouring windows partially open. Predicted levels are shown in Table 6.4.

Although this additional assessment is not required for the Sixth Form Building, the below demonstrates that no disturbance would be expected to any future students in regard to the proposed external unit.

| Receiver | Recommended Target – For sleeping conditions in a bedroom, in BS 8233: 2014 | Noise Level at Receiver (due to plant installation) |
|--|---|---|
| Inside Window of the Sixth Form Building | 30 dB(A) | 7 dB(A) |
| Inside Window of 85 Belsize Park gardens | | 9 dB(A) |

Table 6.4 Noise levels and BS 8233: 2014 criteria inside nearest spaces

7.0 CONCLUSION

An environmental noise survey has been undertaken at 83 Belsize Park Gardens, London. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant in accordance with the requirements of Camden London Borough Council.

A noise impact assessment has then been undertaken using manufacturer noise data to predict the noise levels, due to the proposed plant, at the nearby noise sensitive receivers.

Calculations show that noise emissions from the proposed unit should meet the requirements of Camden London Borough Council with the recommended mitigation installed as stated herein.



Not to scale

Description:

Indicative site plan showing noise monitoring position and nearest sensitive receiver

| | |
|---------------------|------------------------------------|
| Date | 06 April 2023 |
| Reference | 18275-SP1 |
| Project Name | 83 Belsize Park Gardens, London |
| Image © | Google Maps |

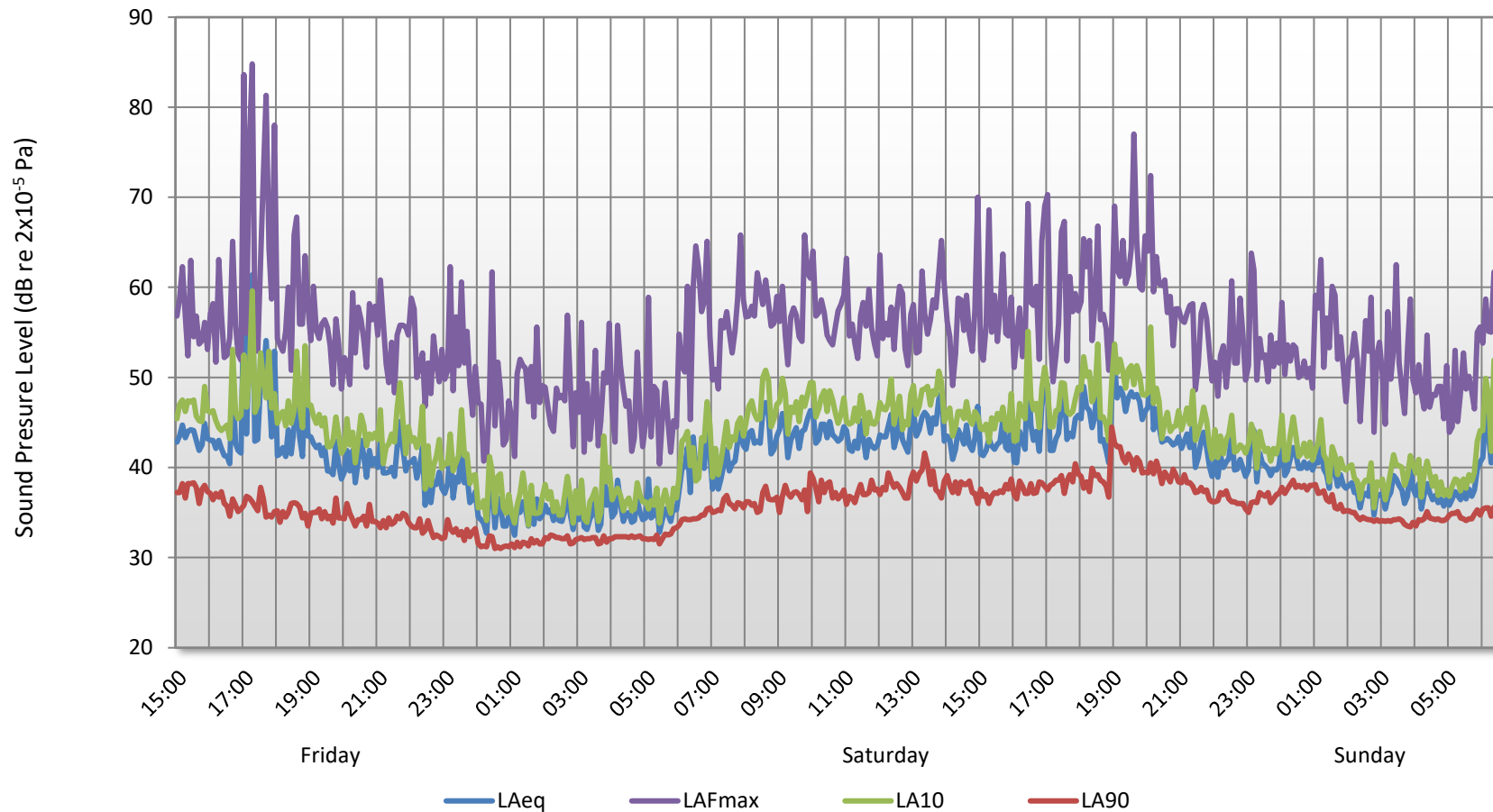
Key:

| |
|----------------------------------|
| Unattended Noise Survey Position |
| Noise Sensitive Receiver |

83 Belsize Park Gardens

Position 1

Environmental Noise Time History
10 March 2023 to 12 March 2023



GLOSSARY OF ACOUSTIC TERMINOLOGY

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and 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.

L₁₀

This is the level exceeded for not more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise

L₉₀

This is the level exceeded for not 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 10 such octave bands whose centre frequencies are defined in accordance with international standards.

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 one alone and 10 sources produce a 10 dB 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 3 dB for each doubling of distance.

Subjective impression of noise

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception 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 reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

| Change in sound level (dB) | Change in perceived loudness |
|----------------------------|------------------------------|
| 1 | Imperceptible |
| 3 | Just barely perceptible |
| 6 | Clearly noticeable |
| 10 | About twice as loud |
| 20 | About 4 times as loud |

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.

Acoustic Calculations

18275

83 Belsize Park Gardens, London

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: 3F Sixth Form Window

Source: Proposed plant installation

| Description | Frequency, Hz | | | | | | | | dB(A) |
|--|---------------|-----------|-----------|-----------|-----------|----------|----------|-----------|-----------|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| Manufacturer provided sound pressure level at 1 metre | | | | | | | | | |
| Fujitsu WOYK160LCTA | 62 | 60 | 58 | 55 | 52 | 48 | 44 | 37 | 57 |
| Correction for reflections, dB | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| Distance correction to receiver, dB (10 m) ^[1] | -20 | -20 | -20 | -20 | -20 | -20 | -20 | -20 | |
| Attenuation provided by boundary wall, dB | -5 | -5 | -5 | -5 | -5 | -5 | -5 | -5 | |
| Mitigation provided by louvred enclosure, dB | -4 | -6 | -9 | -19 | -20 | -20 | -20 | -20 | |
| Sound pressure level at receiver | 36 | 32 | 27 | 14 | 10 | 6 | 2 | -5 | 22 |

[1] Distance loss calculated assuming Point Source attenuation (typically used where distance is more than 3x the largest source dimension)

Design Criterion

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BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window

Source: Proposed plant installation

| Description | Frequency, Hz | | | | | | | | dB(A) |
|---|---------------|-----------|-----------|-----------|-----------|-----------|------------|------------|----------|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| Sound pressure level outside window | 36 | 32 | 27 | 14 | 10 | 6 | 2 | -5 | 21.7 |
| Minimum attenuation from partially open window, dB | -15 | -15 | -15 | -15 | -15 | -15 | -15 | -15 | |
| Sound pressure level inside nearest noise sensitive premises | 21 | 17 | 12 | -1 | -5 | -9 | -13 | -20 | 7 |

Design Criterion

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Acoustic Calculations

18275

83 Belsize Park Gardens, London

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: 85 Belsize Park Gardens

Source: Proposed plant installation

| Description | Frequency, Hz | | | | | | | | dB(A) |
|--|---------------|-----------|-----------|-----------|-----------|----------|----------|-----------|-----------|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| Manufacturer provided sound pressure level at 1 metre | | | | | | | | | |
| Fujitsu WOYK160LCTA | 62 | 60 | 58 | 55 | 52 | 48 | 44 | 37 | 57 |
| Correction for reflections, dB | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| Distance correction to receiver, dB (13 m) ^[1] | -22 | -22 | -22 | -22 | -22 | -22 | -22 | -22 | |
| Mitigation provided by louvred enclosure, dB | -4 | -6 | -9 | -19 | -20 | -20 | -20 | -20 | |
| Sound pressure level at receiver | 39 | 35 | 30 | 17 | 13 | 9 | 5 | -2 | 24 |

[1] Distance loss calculated assuming Point Source attenuation (typically used where distance is more than 3x the largest source dimension)

Design Criterion

24

BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window

Source: Proposed plant installation

| Description | Frequency, Hz | | | | | | | | dB(A) |
|---|---------------|-----------|-----------|----------|-----------|-----------|------------|------------|----------|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| Sound pressure level outside window | 39 | 35 | 30 | 17 | 13 | 9 | 5 | -2 | 24.4 |
| Minimum attenuation from partially open window, dB | -15 | -15 | -15 | -15 | -15 | -15 | -15 | -15 | |
| Sound pressure level inside nearest noise sensitive premises | 24 | 20 | 15 | 2 | -2 | -6 | -10 | -17 | 9 |

Design Criterion

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