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# 40 HILLWAY,
## LONDON

## NOISE IMPACT ASSESSMENT

Report **18033-NIA-01 - RevB**

Prepared on 12 December 2022

**Issued For:**

**Anthony Bandak**

## Executive Summary

This noise impact assessment has been undertaken in order to assess a plant installation for residential use at 40 Hillway, London.

The plant installation comprises the following plant units:

- 2 No. Fujitsu AOYG30KBTA4 Condenser Units
- 1 No. Fujitsu AOYG24KBTA3 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 receiver, identified as the window on the side façade of the adjacent residential property. 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, dependant 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 plant units is 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 for the condenser units

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 should not be relied upon for further reasons, such as the detailed design of mitigation measures.

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| Appendix B | Acoustic Calculations |

| Issue | Date of Issue | Author | Reviewed | Authorised |
|---|---|---|---|---|
| 0 | 02/12/22 | **Kenny Macleod**<br>Senior Consultant<br>BSc (Hons) MIOA | **John Smethurst**<br>Director<br>BSc (Hons) MIOA | **Duncan Martin**<br>Director<br>BSc (Hons) MIOA |
| RevA | 06/12/22 | **Kenny Macleod**<br>Senior Consultant<br>BSc (Hons) MIOA | **John Smethurst**<br>Director<br>BSc (Hons) MIOA | **Duncan Martin**<br>Director<br>BSc (Hons) MIOA |
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| Issue | Comment |
|---|---|
| 0 | First issue |
| RevA | Update of proposed mitigation measures |
| RevB | Minor wording amendments to Section 6.2 |

## 1.0 INTRODUCTION

Clement Acoustics has been commissioned by Anthony Bandak to measure existing background noise levels at 40 Hillway, London. Measured noise levels have been used to determine noise emissions criteria for a plant installation in agreement with the planning requirements of Camden London Borough Council.

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

The site is bound by Hillway to the west, and existing residential dwellings or associated gardens to all other elevations. The surrounding area is predominantly residential in nature.

The current plant installation comprises 2 No. Fujitsu AOYG30KBTA4 condenser units and 1 No. Fujitsu AOYG24KBTA3 condenser unit on the first floor roof at the rear of the building.

The window on the side façade of the adjacent residential property has been identified as the nearest affected receiver. This nearest noise sensitive receiver was 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 any noise mitigation measures are implemented.

Locations are shown in attached site plan 18033-SP1.

## 3.0 ENVIRONMENTAL NOISE SURVEY

### 3.1 Unattended Noise Survey Procedure

Measurements were undertaken at one position as shown on indicative site drawing 18033-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 microphone was mounted on a 1st storey flat roof at the rear of the building.

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 13:15 on 28 November 2022 and 12:25 on 29 December 2022.

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 [28 November 2022] | | | | | |
| 1 | 1 m/s | NE | 12 °C | 70 % | None |
| Meter Collection [29 November 2022] | | | | | |
| 1 | 1 m/s | S | 7 °C | 40 % | None |

**Table 3.2: Noted weather conditions during surveys**

It is understood that the weather conditions during the unattended survey remained generally dry with light winds.

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 18033-SP1.

Measured noise levels are shown as a time history in Figure 18033-TH1, with average ambient and typical background noise levels summarised in Table 4.1.

It should be noted that the guidance of the latest revision of British Standard 4142: 2014 +A1 2019 *'Methods for rating and assessing industrial and commercial sound'*, as detailed in Section 8.1 of the standard is as follows:

*'The objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.'*

Therefore, the typical background noise level will be used for the purpose of this assessment.

| Time Period | Average ambient noise level $L_{eq:\,T}$ | Typical background noise level $L_{90:\,5min}$ |
|---|---|---|
| Daytime (07:00 - 23:00) | 46 dB(A) | 36 dB(A) |
| Night-time (23:00 - 07:00) | 36 dB(A) | 25 dB(A) |

**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 criteria for noise emissions are outlined in the Camden Local Plan (2017) and 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 (15 dB if tonal components are present) should be considered as the design criterion."*

It is understood that the plant units are for residential use, and could be in use at any time over a 24 hour period.

Based on the results of the environmental noise survey and requirements of Camden London Borough Council, 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 $L_{eq;T}$ |
|---|---|
| Night-time<br>(23:00 - 07:00) | 15 dB(A) |

**Table 5.1: Plant noise emission limits**

However, it should be noted that BS 4142: 1997 states that:

> *'For the purposes of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low.'*

Taking into account the above guidance, it would typically be considered suitable to set the proposed plant noise emissions criterion at a higher level.

In line with the guidance in BS 4142, where the rating level does not exceed the background noise level, this is an indication that the specific sound source would be expected to have a low impact.

A noise emissions criterion at a level of **25 dB(A)**, which would still be considered to be an extremely low criterion would therefore be considered appropriate.

Although, based on previous assessments undertaken for Camden London Borough Council, it is understood that deviations from the stated noise emissions criteria are not generally accepted.

Therefore, the plant noise emission limit of **15 dB(A)** will be used for the purpose of the assessment.

## 6.0 PLANT NOISE IMPACT ASSESSMENT

### 6.1 Plant Installation

The plant installation comprises the following:

- 2 No. Fujitsu AOYG30KBTA4 condenser units
- 1 No. Fujitsu AOYG24KBTA3 condenser unit

Noise emissions for the plant units, 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, **and therefore it should be noted that onsite measured noise levels could therefore differ from those shown below.**

| Plant Unit | Sound Pressure Levels (at 1 meter, dB) in each Frequency Band | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | dB(A) |
| Fujitsu AOYG30KBTA4 | 66 | 67 | 55 | 50 | 49 | 45 | 42 | 35 | 56 |
| Fujitsu AOYG24KBTA3 | 61 | 57 | 56 | 54 | 47 | 42 | 40 | 37 | 54 |

**Table 6.1: Manufacturer provided noise emissions levels**

British Standard 4142: 2014 +A1 2019 *'Methods for rating and assessing industrial and commercial sound'* provides guideline penalties that can be applied to noise emissions to account for tonality, impulsivity and intermittency. Where a sound source is neither tonal nor impulsive, but is still distinctive against the residual acoustic environment, a penalty may still be applied.

The available penalties for different characteristics are summarised in Table 6.2.

| Characteristic | Comments | Maximum Penalty |
|---|---|---|
| Tonality | Can be converted to 2 dB for a tone which is just perceptible, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible | +6 dB |
| Impulsivity | Can be converted to 3 dB for impulsivity which is just perceptible, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible | +9 dB |
| Intermittency | When the sound has identifiable on/off conditions | +3 dB |
| Distinctiveness | Intended for sources that are neither tonal nor impulsive, but distinctive against background noise sources | +3 dB |

**Table 6.2: Available penalties according to BS 4142: 2014**

The plant units are considered to be generally broadband and continuous in nature and therefore no penalty has been applied.

The plant location is on the first floor roof at the rear of the building which is shown on indicative site plan 18033-SP1.

## 6.2 Proposed Mitigation Measures

In order to meet the proposed criteria stated in Section 5.0, it is understood that the preference is to leave the units in the existing location and install an acoustic enclosure. The enclosure should be designed to provide sufficient attenuation to achieve a maximum sound pressure level of 28 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 6.3 should be suitable to achieve this.

| Mitigation | *Required Attenuation (dB) in each Frequency Band* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz |
| Louvred Enclosure | 26 | 31 | 36 | 43 | 49 | 49 | 50 | 47 |

**Table 6.3: Attenuation provided by mitigation**

The above values should be provided to an enclosure manufacturer, who should be able to advise on the practicality of achieving these levels.

## 6.3 Noise Impact Assessment

The closest receiver has been identified as the window on the side façade of the adjacent residential property which is a minimum of 3.5 m from the plant locations.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.4. Detailed calculations are shown in Appendix B.

| Receiver | Night Time Hours Criterion | Noise Level at Receiver (due to plant installation) |
|---|---|---|
| Nearest Residential Property | 15 dB(A) | 15 dB(A) |

**Table 6.4: Noise levels and project criterion at noise sensitive receivers**

As presented in Table 6.4 and Appendix B, the plant installation with acoustic enclosure would not 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 15 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 6.5.

| Receiver | Recommended Target – *For sleeping conditions in a bedroom, in BS 8233: 2014* | Noise Level at Receiver (due to plant installation) |
|---|---|---|
| Inside Residential Window | 30 dB(A) | < 10 dB(A) |

**Table 6.5: Noise levels and BS 8233: 2014 criteria inside nearest residential space**

## 7.0 CONCLUSION

An environmental noise survey has been undertaken at 40 Hillway, London. The results of the survey have enabled criteria to be set for noise emissions from the 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 plant, at the nearby noise sensitive receivers.

Calculations show that noise emissions from the plant units could meet the requirements of Camden London Borough Council with the recommended mitigation installed as stated herein.

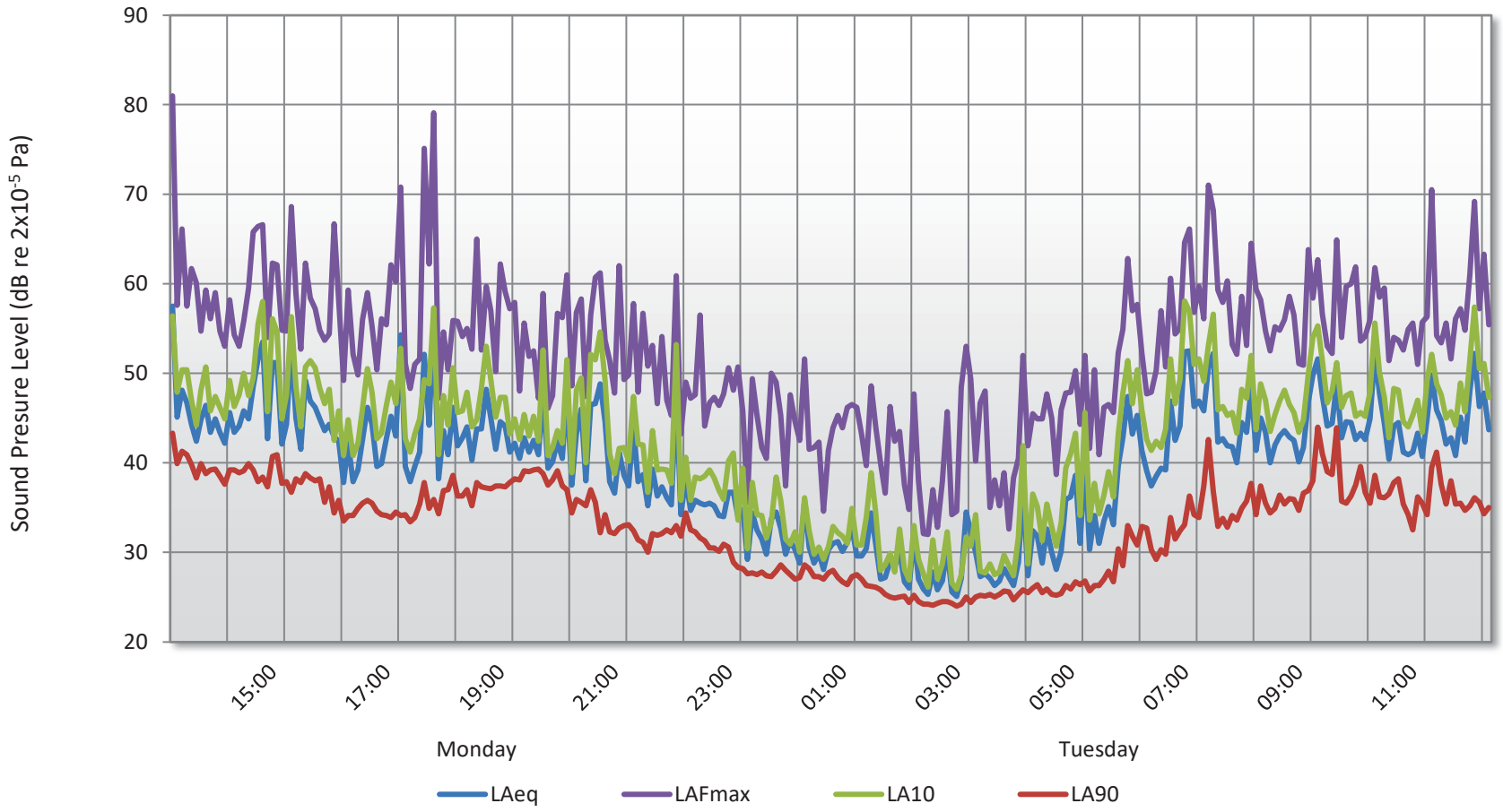

**18033-SP1** Indicative site plan indicating noise monitoring position and nearest noise sensitive receiver (image © Google)

**Date:** 6 December 2022

## 40 Hillway, London

### Position 1

Environmental Noise Time History
28 November 2022 to 29 November 2022




18033-TH1

# APPENDIX A

## 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.

### $L_{10}$

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

### $L_{90}$

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.

# APPENDIX B

## 18033

## 40 HILLWAY, LONDON

### EXTERNAL PLANT NOISE EMISSIONS CALCULATION

**Receiver: Nearest Residential Receiver**
Source: Plant installation

| | Frequency, Hz | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *63* | *125* | *250* | *500* | *1k* | *2k* | *4k* | *8k* | *dB(A)* |
| **Manufacturer provided sound pressure level at 1 metre** | | | | | | | | | |
| Fujitsu AOYG30KBTA4 | 66 | 67 | 55 | 50 | 49 | 45 | 42 | 35 | 56 |
| Correction for reflections, dB | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| Required attenuation from mitigation, dB (Louvred Enclosure) | -26 | -31 | -36 | -43 | -49 | -49 | -50 | -47 | |
| Distance correction to receiver, dB (3.5 m) [1] | -11 | -11 | -11 | -11 | -11 | -11 | -11 | -11 | |
| **Sound pressure level due to Fujitsu AOYG30KBTA4** | **32** | **28** | **11** | **-1** | **-8** | **-12** | **-16** | **-20** | **14** |
| | | | | | | | | | |
| Fujitsu AOYG24KBTA3 | 61 | 57 | 56 | 54 | 47 | 42 | 40 | 37 | 54 |
| Correction for reflections, dB | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| Required attenuation from mitigation, dB (Louvred Enclosure) | -26 | -31 | -36 | -43 | -49 | -49 | -50 | -47 | |
| Distance correction to receiver, dB (4.5 m) [1] | -13 | -13 | -13 | -13 | -13 | -13 | -13 | -13 | |
| **Sound pressure level due to Fujitsu AOYG24KBTA3** | **25** | **16** | **10** | **0** | **-13** | **-17** | **-20** | **-21** | **6** |
| | | | | | | | | | |
| Fujitsu AOYG30KBTA4 | 66 | 67 | 55 | 50 | 49 | 45 | 42 | 35 | 56 |
| Correction for reflections, dB | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| Required attenuation from mitigation, dB (Louvred Enclosure) | -26 | -31 | -36 | -43 | -49 | -49 | -50 | -47 | |
| Distance correction to receiver, dB (5.5 m) [1] | -15 | -15 | -15 | -15 | -15 | -15 | -15 | -15 | |
| **Sound pressure level due to Fujitsu AOYG30KBTA4** | **28** | **24** | **7** | **-5** | **-12** | **-16** | **-20** | **-24** | **10** |
| | | | | | | | | | |
| **Cumulative sound pressure level at receiver** | **34** | **30** | **15** | **4** | **-6** | **-10** | **-13** | **-16** | **15** |

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

| | |
|---|---|
| **Design Criterion** | **15** |

### BS 8233 ASSESSMENT CALCULATION

**Receiver: Inside Nearest Residential Window**
Source: Plant installation

| | Frequency, Hz | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *63* | *125* | *250* | *500* | *1k* | *2k* | *4k* | *8k* | *dB(A)* |
| Sound pressure level outside window | 34 | 30 | 15 | 4 | -6 | -10 | -13 | -16 | 15 |
| Minimum attenuation from partially open window, dB | -15 | -15 | -15 | -15 | -15 | -15 | -15 | -15 | |
| **Sound pressure level inside nearest noise sensitive premises** | **19** | **15** | **-1** | **-12** | **-21** | **-25** | **-28** | **-31** | **0** |

| | |
|---|---|
| **Design Criterion** | **30** |