



**70 Whitley Street, Reading, RG2 0EQ**

**26<sup>th</sup> April 2024**

**ISSUE 01**





## CONTENTS

|           |                                                    |    |
|-----------|----------------------------------------------------|----|
| 1         | INTRODUCTION .....                                 | 4  |
| 2         | NOISE CRITERIA .....                               | 5  |
| 2.1       | NATIONAL PLANNING POLICY FRAMEWORK .....           | 5  |
| 2.2       | NOISE POLICY STATEMENT FOR ENGLAND .....           | 5  |
| 2.3       | PLANNING POLICY GUIDANCE .....                     | 6  |
| 2.4       | BRITISH STANDARD 4142:2014 .....                   | 6  |
| 3         | SITE SURVEYS.....                                  | 8  |
| 3.1       | SITE DESCRIPTION .....                             | 8  |
| 3.2       | ENVIRONMENTAL SITE SURVEY PROCEDURE .....          | 8  |
| 3.3       | EQUIPMENT .....                                    | 9  |
| 4         | NOISE SURVEY .....                                 | 10 |
| 5         | NOISE IMPACT ASSESSMENT.....                       | 12 |
| 5.1       | PROPOSED PLANT.....                                | 12 |
| 5.2       | CLOSEST NOISE SENSITIVE RECEIVER.....              | 14 |
| 5.3       | NOISE EMISSION CRITERION .....                     | 15 |
| 5.4       | BS4142 ASSESSMENT- Nearest Residential Window..... | 15 |
| 5.5       | MITIGATION MEASURES.....                           | 16 |
| 6         | SUMMARY AND CONCLUSIONS.....                       | 17 |
| APPENDIX: |                                                    |    |
| A         | ACOUSTIC TERMINOLOGY.....                          | 18 |
| B         | CALCULATIONS .....                                 | 20 |
| C         | MEASUREMENTS .....                                 | 22 |



| Author               | Date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Checked              | Date       | Description  |
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| L. Jennings Tec. IOA | 26/04/2024                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | M.Austin I.Eng. MIOA | 29/04/2024 | Information. |
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## 1.0 INTRODUCTION

Page | 4

DAA Group has been appointed to carry out a Noise Impact Assessment at 70 Whitley Street, Reading, RG2 0EQ to support a Planning Application for the installation of 8 Off Condenser Units.

The purpose of the survey is to ensure that the development does not prejudice the amenities of occupiers of nearby premises.

This report has been carried out in accordance with the provisions of:

- The National Planning Policy Framework, the Noise Policy Statement for England (NPSE)
- The World Health Organisation Guidelines for Community Noise 1999 (WHO)
- Reading Local Plan

The technical content of this assessment has been provided by a Tech member of the Institute of Acoustics.

The Institute of Acoustics is the UK's professional body for those working in Acoustics, Noise and Vibration.

## **2.0 NOISE CRITERIA**

### **2.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)**

The Department for Communities and Local Government introduced the National Planning Policy Framework (NPPF) in March 2012. The latest revision of the NPPF is dated December 2023.

Page | 5

The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework where local Councils can produce their own local and neighbourhood plans which reflect the needs of their communities.

In conserving and enhancing the natural environment, the planning system should prevent both new and existing development from contributing to, or being put at, unacceptable risk from environmental factors including noise.

Planning policies and decisions should aim to avoid noise giving rise to significant adverse impacts on health and quality of life as a result of new development. Conditions may be used to mitigate and reduce noise to a minimum so that adverse impacts on health and quality of life are minimised. It must be recognised that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them. Reference is made within NPPF to the Noise Policy Statement for England (NPSE) as published by DEFRA in March 2010.

### **2.2 NOISE POLICY STATEMENT FOR ENGLAND (NPSE)**

The long-term vision of the NPSE is stated within the documents scope, 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'. The policy aims are stated to:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

The application of NPSE should mean that noise is properly taken into account at the appropriate time (for example in planning applications or appeals) where it must be considered alongside other relevant issues. The guiding principles of Government policy on sustainable development should be used to assist in the implementation of the NPSE.

The NPSE should apply to all types of noise apart from occupational noise in the workplace. The types of noises defined in the NPSE includes:

- Environmental noise from transportation sources;
- Neighbourhood noise which includes noise arising from within the community; industrial premises, trade and business premises, construction sites and noise in the street

The Noise Policy Statement England (NPSE) outlines observed effect levels relating to the above, as follows:

- **NOEL – No Observed Effect Level**

- o This is the level below which no effect can be detected. In simple terms, below

this level, there is no detectable effect on health and quality of life due to the noise.

- **LOAEL – Lowest Observed Adverse Effect Level**

- o This is the level above which adverse effects on health and quality of life can be detected.

- **SOAEL – Significant Observed Adverse Effect Level**

- o This is the level above which significant adverse effects on health and quality of life occur.

As stated in The Noise Policy Statement England (NPSE), it is not currently possible to have a single objective based measure that defines SOAEL that is applicable to all sources of noise in all situations. Specific noise levels are not stated within the guidance for this reason, and allow flexibility in the policy until further guidance is available.

## **2.3 ProPG: PLANNING AND NOISE**

As outlined above, the National Planning Policy Framework encourages improved standards of design, although it provides no specific noise levels which should be achieved on site for varying standards of acoustic acceptability, or a prescriptive method for the assessment of noise.

ProPG: Planning and Noise was published in May 2017 in order to encourage better acoustic design for new residential schemes in order to protect future residents from the harmful effects of noise. This guidance can be seen as the missing link between the current NPPF and its predecessor, PPG24 (Planning Policy Guidance 24: Planning and Noise), which provided a prescriptive method for assessing sites for residential development, but without the nuance of 'good acoustic design' as outlined in ProPG.

ProPG allows the assessor to take a holistic approach to consider the site's suitability, taking into consideration numerous design factors which previously may not have been considered alongside the noise level measured on site, for example the orientation of the building in relation to the main source of noise incident upon it.

It should be noted this document is not an official government code of practice, and neither replaces nor provides an authoritative interpretation of the law or government policy, and therefore should be seen as a good practice document only.

## **2.4 BRITISH STANDARD 4142: 2014+A1:2019**

British Standard (BS) 4142:2014 "Methods for rating and assessing industrial and commercial sound" describes methods for assessing the likely effects of sound on premises used for residential purposes.

It includes the assessment of sound from industrial and manufacturing processes, M&E plant and equipment, loading and unloading of goods and materials, and mobile plant/vehicles on the site. It can be used to assess sound from proposed, new, modified or additional industrial/commercial sources, at existing or new premises used for residential purposes.

The method described in BS4142: 2014 use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

The standard describes methods to measure and determine ambient, background and residual sound levels, and the rating levels of industrial/commercial sound. BS 4142: 2014 requires consideration of the level of uncertainty in the data and associated calculations.

BS 4142 is not intended to be used for the derivation or assessment of internal sound levels, or for the assessment of non-industrial / commercial sources such as recreational activities, motorsport, music and entertainment, shooting grounds, construction and demolition, domestic animals, people, and public address systems for speech.

The Reference Time Interval, T, is defined in the standard as the "specified interval over which the specific sound level is determined", which is 1 hour during the daytime (07:00 to 23:00 hours) and 15 minutes during the night (23:00 to 07:00 hours).

Ambient sound is defined in BS 4142: 2014 as "totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far". It comprises the residual sound and the specific sound when present.

Residual sound is defined in BS 4142: 2014 as "ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound".

The background sound level is the LA90, T of the residual sound level, and is the underlying level of sound. Measurements of background sound level should be undertaken at the assessment location where possible or at a comparable location.

The measurement time interval should be sufficient to obtain a representative value (normally not less than 15 minutes) and the monitoring duration should reflect the range of background sound levels across the assessment period. The background sound level used for the assessment should be representative of the period being assessed.

The specific sound level is the LAeq,T of the sound source being assessed over the reference time interval, Tr. BS 4142: 2014 advises that Tr should be 1 hour during the day and 15 minutes at night.

The rating level is the specific sound level plus any adjustment for the characteristics of the sound (tone, impulse, intermittent or other acoustic feature). The standard describes subjective and objective methods to establish the appropriate adjustment. The adjustments for the different features and assessment methods are summarised in the table below.

#### Acoustic Feature Corrections in BS4142: 2014

| Acoustic Feature | Adjustment for Acoustic Feature                                                          |                                                                        |                                                             |
|------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------|
|                  | Subjective Methods                                                                       | Objective Methods                                                      |                                                             |
| Tonality         | +2 dB if just perceptible<br>+4 dB if clearly perceptible<br>+6 dB if highly perceptible | Third Octave Analysis                                                  | Narrow Band Analysis                                        |
|                  |                                                                                          | +6 dB if tones identified                                              | Sliding scale of 0 to +6 dB depending on audibility of tone |
| Impulsivity      | +3 dB if just perceptible<br>+6 dB if clearly perceptible<br>+9 dB if highly perceptible | Sliding scale of 0 to +9 dB depending on prominence of impulsive sound |                                                             |
| Intermittency    | + 3 dB if intermittency is readily distinctive                                           | n/a                                                                    |                                                             |
| Other            | + 3 dB if neither tonal nor impulsive, but otherwise readily distinctive                 | n/a                                                                    |                                                             |



Where tonal and impulsive characters are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant, it might be appropriate to apply a single correction. The rating level is equal to the specific sound level if there are no features present.

The level of impact is assessed by comparing the rating level of the specific sound source with the background sound level. Typically the greater the difference the greater the magnitude of the impact, depending on the context.

Other factors that may require consideration include the absolute level of sound, the character and level of the residual sound compared to the specific sound, and the sensitivity of the receptor and scope for mitigation.

When the rating level is above the background sound level, a difference of around +5 dB is likely to indicate an adverse impact and a difference of around +10 dB or more is likely to indicate a significant adverse impact, depending on the context.

The lower the rating level with respect to the background sound level, the less likely it is that the specific sound source will have an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

### **3.0 SITE SURVEYS**

#### **3.1 SITE DESCRIPTION**

The application site is a mixed-use detached property, located on Whitley Street. The site is typical of an urban cityscape environment, with the dominant source being road traffic noise from the surrounding roads. (See Figure 3.1)

Page | 9



Figure 3.1 – Site Location

#### **3.2 ENVIRONMENTAL SITE SURVEY PROCEDURE**

In order to characterise the sound profile of the area at the closest sensitive receptor (NSR), an environmental sound survey has been carried out from 22/04/2024 to 23/04/2024. The monitoring position was chosen in order to collect representative sound levels at the NSR and the location of the plant.

Noise Measurements were carried out Free Field. The monitoring location is shown in Figure 5.2.

### 3.3 EQUIPMENT

|                                   |                        |
|-----------------------------------|------------------------|
| <b>Instrument manufacturer</b>    | <b>Cirrus</b>          |
| <b>Model</b>                      | <b>CR:247 Invictus</b> |
| <b>Serial Number</b>              | <b>V069182</b>         |
| <b>Microphone Type</b>            | <b>MK: 224</b>         |
| <b>Serial Number</b>              | <b>217360D</b>         |
| <b>Calibrator</b>                 | <b>NC-74</b>           |
| <b>Serial Number</b>              | <b>34494274</b>        |
| <b>Cirrus CK: 675 Outdoor Kit</b> |                        |

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of  $\leq 0.5$  dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period.

### 3.4 METEOROLOGICAL CONDITIONS

As the environmental noise survey was carried out over a long un-manned period no localized records of weather conditions were taken. However, during the set up and collection of the monitoring equipment, the weather conditions have been documented in the following table. All measurements have been compared with met office weather data of the area, specifically the closest weather station, the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.



| Weather Conditions – Benson Weather station |                |               |                           |                  |
|---------------------------------------------|----------------|---------------|---------------------------|------------------|
| Time Period                                 | Air Temp ( °C) | Rainfall mm/h | Prevailing Wind Direction | Wind Speed (m/s) |
| 22/04/2024 – 00:00 – 23:59                  | 1 - 8          | 0.1           | NNW                       | 2 - 3            |
| 23/04/2024 – 00:00 – 13:00                  | 6 - 12         | 0.0           | NNW                       | 2 - 9            |

Page | 11

Table 3.4 – Weather Summary

#### 4.0 NOISE SURVEY

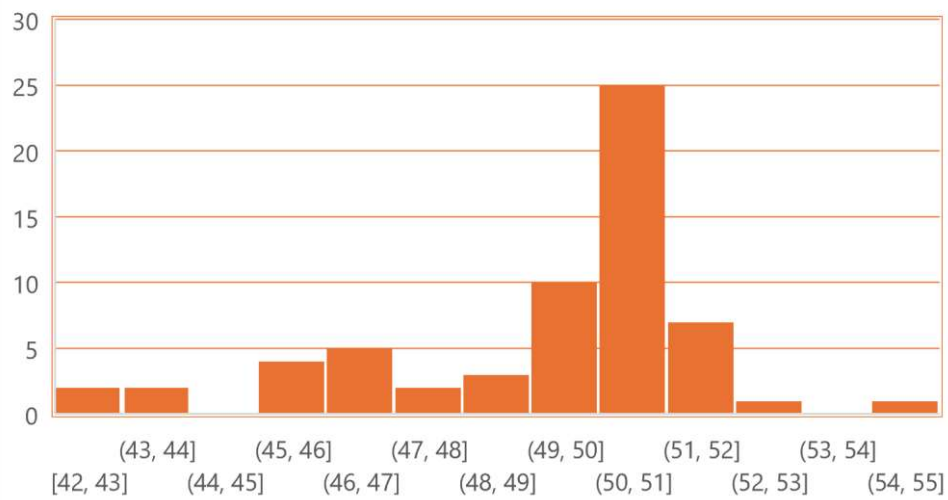
The background sound levels have been calculated in accordance with BS 4142:2014, which represents the most up-to-date guidance on the subject. Prior to the publication of the 2014 version of BS 4142, acousticians would use the lowest measured background sound levels; however, BS 4142: 2104 provides substantially more guidance on the determination of background sound levels. Section 8.1 of BS 4142: 2014 states that “for this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods. Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes”. The guidance goes on to say that “a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value”.

| Period        | LA90,15 |
|---------------|---------|
| 07:00 – 23:00 | 50dB    |
| 23:00 – 07:00 | 29dB    |

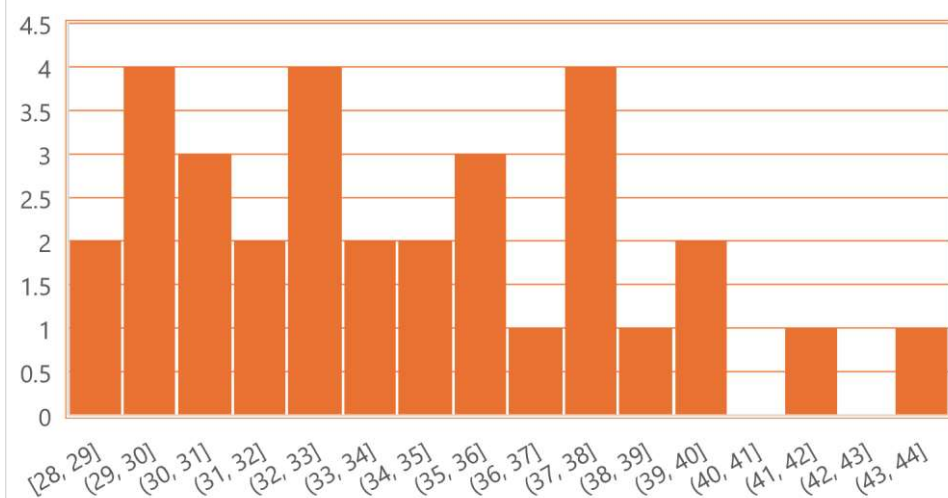
Table 4.1 Background Sound Level Summary Results

The existing condenser unit at the site was not in operation during the assessment and is being removed.

LA90 Histogram 07:00 - 23:00



LA90 Histogram 23:00 - 07:00





## 5.0 NOISE IMPACT ASSESSMENT

5.1 It is understood that the plant is comprised of the following units:

- 1 x Tecumseh – CAJ 2464 Z 1 HP
- 1 x Tecumseh – CAJ 2464 Z 1.5 HP
- 2 x Tecumseh – CAJ 2464 Z 2 HP
- 4 x Tecumseh – CAJ 2464 Z 3 HP

Page | 13

The plant location is shown below in figure 5.2

| Proposed Plant | SPL (dB(A)) |
|----------------|-------------|
| CAJ2464Z HP1   | 46          |
| CAJ2464Z HP1.5 | 50          |
| CAJ2464Z HP2   | 50          |
| CAJ2464Z HP3   | 67          |

Table 5.1 – Manufacturer supplied Sound levels

The manufacturer had no detailed octave band levels for these units.

## 5.2 CLOSEST NOISE SENSITIVE RECEIVER

The closest noise sensitive receiver to the installation location of the plant has been identified as being a residential window located approximately 6 metres from the condenser units as shown in Figure 5.2.

Page | 14



Figure 5.2 – Plant and measurement location and nearest sensitive receiver.

|                                                                                     |                                            |
|-------------------------------------------------------------------------------------|--------------------------------------------|
|  | Proposed Location Condenser units          |
|  | Nearest Residential Noise Sensitive Window |
|  | Measurement Location                       |



### 5.3 NOISE EMISSION CRITERION

It is understood that the condensers will be operating over 24hrs.

It is determined that the proposed unit is not considered to contain tones. In addition, the proposed operation of the equipment is also unlikely to be sufficiently intermittent to attract attention at the nearest noise sensitive property.

Page | 15

The criteria for plant sound, to be achieved at a point 1m from the closest noise sensitive window, has been set as shown in Table 5.3. As the background noise level is extremely low during the night-time period 23:00 – 07:00, the criterion of 5dB below will be a suitable at 1m away from the nearest noise sensitive receiver. It is also noted that the calculations will be a worse case scenario as all units are unlikely to be running at the same time constantly.

| Time Period   | Noise Criterion at Nearest Residential Receiver |
|---------------|-------------------------------------------------|
| 07:00 – 23:00 | 40                                              |
| 23:00 – 07:00 | 24                                              |

Table 5.3 - Proposed noise emissions criterion

### 5.4 BS4142 ASSESSMENT – 1m outside Nearest residential Window

| BS4142:2014 Assessment                       |                 |               |
|----------------------------------------------|-----------------|---------------|
| Source<br>Operating Period                   | Condenser Units |               |
|                                              | 07:00 – 23:00   | 23:00 – 07:00 |
| Reference Time Interval (Tr)                 | 15 minutes      |               |
| Element                                      | Level (dB)      |               |
| Specific Sound Level                         | 57              |               |
| Representative Background Noise Level (LA90) | 50              | 29            |
| Acoustic feature correction                  | 3               |               |
| Rating Level                                 | 50              |               |
| Excess of Rating over Background Sound Level | 0               | +21           |

Detailed calculations are shown in Appendix B.

## 5.5 MITIGATION MEASURES

BS 4142:2014 “Methods for rating and assessing industrial and commercial sound” presents a method for assessing the significance and possible adverse impact due to an industrial noise source, based on a comparison of the source noise levels and the background noise levels, both of which are measured or predicted at a noise sensitive receiver e.g. a residential property.

Page | 16

The specific noise level due to the source is determined, with a series of corrections for tonality, impulsivity, intermittency or other unusual characteristic. The rating level is then compared to the background noise level and the significance of the new noise source likelihood of any adverse impact is determined in accordance with the following advice:

“The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occur. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context. The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.”

With a calculated Rating of 50dB, this is 0dB during the daytime and +21dB over the background noise during night-time.

To mitigate the excess noise, DAA Group recommend installing an acoustic enclosure. An example acoustic enclosure to achieve that will achieve the required noise reduction is shown below in figure 5.5.



Figure 5.5 – Enclosures UK DE034 Enclosures – 27dB Noise Reduction

With the addition of the acoustic enclosures, the Rating level would be 23dB. Calculations can be found in Appendix C.

To mitigate vibration, DAA Group recommend mounting the units on suitable isolation systems; suitable systems include the Kinetics Model AC (supplied by CMS Acoustics) and Mini Split Kits (supplied by Big Foot Systems).



## 6.0 SUMMARY AND CONCLUSIONS

DAA Group has been appointed to carry out a Noise Impact Assessment at 70 Whitley Street, Reading, RG2 0EQ. The purpose of the survey was to assess the level of noise emanating from the proposed condenser units to the nearest residential units and to advise on the level and type of mitigation that will be required.

Page | 17

Manufacturer's noise data of proposed plant has been used to obtain Specific and Rated Noise Level at the nearest noise sensitive receiver in accordance with British Standard BS4142:2014+A1:2019 for compliance with Local Authority requirements.

The rating level was compared with the representative background noise level to assess the likelihood of impact considering the environmental noise context of the area as per the requirements of BS4142:2014+A1:2019.

A Rating level of 23dB has been calculated with the proposed mitigation measures. This is below the required criteria.

It has been concluded that noise emissions from the proposed plant would not have an adverse impact on the nearest residential receivers provided the mitigation set out in this report is followed.

## APPENDIX A ACOUSTIC TERMINOLOGY

### B.1 WEIGHTED DECIBEL, dB(A)

Page | 18

The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. An increase or decrease of approximately 10 dB corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 2 to 3 dB is subjectively barely perceptible.

### B.2 EQUIVALENT CONTINUOUS SOUND LEVEL, $L_{Aeq}$

Another index for assessment for overall noise exposure is the equivalent continuous sound level,  $L_{Aeq}$ . This is a notional steady level which would, over a given period, deliver the same sound energy as the actual time-varying sound over the same period.

### B.3 MAXIMUM NOISE LEVEL, $L_{Amax}$

The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125 ms in duration.

### B.4 NOISE RATING, NR

Noise ratings are used as a single figure criterion for specifying services noise in buildings. Each noise rating value has an associated spectrum of defined values in each third or octave frequency band. To determine the noise rating of a room the measured spectrum is compared to a set of noise rating curves. The highest NR curve that crosses any single frequency band of the measurement determines the noise rating for the room.

The single figure noise rating is read at the 1 kHz band.

### B.5 SOUND LEVEL DIFFERENCE (D)

The sound insulation required between two spaces may be determined by the sound level difference needed between them. A single figure descriptor which characterises a range of frequencies, the weighted sound level difference,  $D$ , is sometimes used (BS EN ISO 717-1). This parameter is not adjusted to reference conditions.

The standardized level difference,  $D_n$ , T is a measure of the difference in sound level between two rooms, in each frequency band, where the reverberation time in the receiving room has been normalised to 0.5 s. This parameter measures all transmission paths, including flanking paths.

The weighted standardized level difference,  $D_{nTw}$ , is a measure of the difference in sound level between two rooms, which characterises a range of frequencies and is normalised to a reference reverberation time

### B.6 SOUND REDUCTION INDEX (R)

The sound reduction index (or transmission loss) of a building element is a measure of the loss of sound through the material, i.e. its attenuation properties. It is a property of the component, unlike the sound level difference which is affected by the common area between the rooms and the acoustic of the receiving room. The weighted sound reduction index,  $R_w$ , is a single figure description of sound reduction index characterising a range of frequencies, which is defined in BS EN ISO 717-1: 1997. The  $R_w$  is calculated from measurements in an acoustic laboratory

## B.7 STATISTICAL NOISE LEVELS ( $L_{A90, (T)}$ $L_{A1, (T)}$ $L_{A10, (T)}$ etc.)

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The  $L_{A10}$  is the level exceeded for ten per cent of the time under consideration, has historically been

adopted in the UK for the assessment of road traffic noise. The  $L_{A90}$  is the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The  $L_{A1}$  the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted  $L_{A10, dB}$   $L_{A90, dB}$  etc. The reference time (T) is normally included, e.g.  $L_{A10, (5min)}$ , &  $L_{A90, (8hr)}$ .

## B.8 TYPICAL NOISE LEVELS

Typical noise levels are given in the following table.

| Noise Level dB(A) | Example                               |
|-------------------|---------------------------------------|
| 130               | Threshold of pain                     |
| 120               | Jet aircraft take-offs at 100 m       |
| 110               | Chain saw at 1 m                      |
| 100               | Inside disco                          |
| 90                | Heavy lorries at 5 m                  |
| 80                | Kerbside of busy street               |
| 70                | Loud radio (in typical domestic room) |
| 60                | Office or restaurant                  |
| 50                | Domestic fan heaters at 1m            |
| 40                | Living room                           |
| 30                | Ventilation Noise in Theatre          |
| 20                | Remote countryside on still night     |
| 10                | Sound insulated test chamber          |
| 0                 | Threshold of hearing.                 |



## APPENDIX B CALCULATIONS

| NOISE EMISSION CALCULATION |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
|----------------------------|---------------------------------------------|-----|-----|----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| ITEM                       | PARAMETER                                   |     |     | HZ |   | 63  | 125 | 250 | 500 | 1K  | 2K  | 4K  | 8K  | dBA |
| 1                          | Schedule of Plant                           | Qty |     |    |   |     |     |     |     |     |     |     |     |     |
| 2                          | Toshiba                                     |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 3                          | Tecumseh CAJ 2464 Z hp1                     | 1   | Spl | dB | + | 48  | 50  | 49  | 44  | 43  | 36  | 32  | 31  | 46  |
|                            | Tecumseh CAJ 2464 Z hp1,5                   | 1   | Spl | dB | + | 52  | 54  | 53  | 48  | 47  | 40  | 36  | 35  | 50  |
| 4                          | Tecumseh CAJ 2464 Z hp2                     | 2   | Spl | dB | + | 55  | 57  | 56  | 51  | 50  | 43  | 39  | 38  | 53  |
| 5                          | Tecumseh CAJ 2464 Z hp3                     | 4   | Spl | dB | + | 75  | 77  | 76  | 71  | 70  | 63  | 59  | 58  | 73  |
| 6                          | Revised Spl:                                | 8   | Spl | dB | + | 75  | 77  | 76  | 71  | 70  | 63  | 59  | 58  | 73  |
| 7                          |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 8                          |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 9                          |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 10                         |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 11                         | Distance to nearest receptor    Metres:     | 6   |     | dB | - | -16 | -16 | -16 | -16 | -16 | -16 | -16 | -16 | -16 |
| 12                         | SPL=L1-20log <sub>10</sub> ( r2/r1)         | 1   |     |    |   |     |     |     |     |     |     |     |     |     |
| 13                         |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 14                         |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 15                         |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 16                         | Spl at receptor                             |     |     | dB | + | 33  | 35  | 34  | 29  | 28  | 21  | 17  | 16  | 57  |
| 17                         |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 18                         |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 19                         | Façade correction                           | 3.0 |     | dB | + | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   |
| 20                         | Natural Barrier                             | 10  |     | dB | - | 10  | 10  | 10  | 10  | 10  | 10  | 10  | 10  | 10  |
| 21                         |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 22                         |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 23                         | Specific noise level at receptor            |     |     | dB | + | 36  | 38  | 37  | 32  | 31  | 24  | 20  | 19  | 50  |
| 24                         | (1m outside noise sensitive window)         |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 25                         | Background Noise Levels:(L <sub>A90</sub> ) |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 26                         | Day time (07:00 - 23:00)                    |     |     |    |   |     |     |     |     |     |     |     |     | 50  |
| 27                         | Difference: (Assessment level)              |     |     | dB | - |     |     |     |     |     |     |     |     | 0   |
| 28                         |                                             |     |     |    |   |     |     |     |     |     |     |     |     |     |
| 29                         | Night-time (23:00-07:00)                    |     |     |    |   |     |     |     |     |     |     |     |     | 29  |
| 30                         | Difference: (Assessment level)              |     |     | dB | - |     |     |     |     |     |     |     |     | 21  |
|                            | E&OE                                        |     |     |    |   |     |     |     |     |     |     |     |     |     |



| NOISE EMISSION CALCULATION |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
|----------------------------|---------------------------------------|-----|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| ITEM                       | PARAMETER                             |     |      | HZ   | 63  | 125 | 250 | 500 | 1K  | 2K  | 4K  | 8K  | dBA |
| 1                          | Schedule of Plant                     | Qty |      |      |     |     |     |     |     |     |     |     |     |
| 2                          | Toshiba                               |     |      |      |     |     |     |     |     |     |     |     |     |
| 3                          | Tecumseh CAJ 2464 Z hp1               | 1   | Spl  | dB + | 48  | 50  | 49  | 44  | 43  | 36  | 32  | 31  | 46  |
|                            | Tecumseh CAJ 2464 Z hp1.5             | 1   | Spl  | dB + | 52  | 54  | 53  | 48  | 47  | 40  | 36  | 35  | 50  |
| 4                          | Tecumseh CAJ 2464 Z hp2               | 2   | Spl  | dB + | 55  | 57  | 56  | 51  | 50  | 43  | 39  | 38  | 53  |
| 5                          | Tecumseh CAJ 2464 Z hp3               | 4   | Spl  | dB + | 75  | 77  | 76  | 71  | 70  | 63  | 59  | 58  | 73  |
| 6                          | Acoustic Enclosure - DE038            | 1   | Spl  | dB + | 14  | 17  | 27  | 31  | 37  | 39  | 38  | 39  | 27  |
| 7                          | Revised Spl:                          | 8   | Spl  | dB + | 61  | 60  | 49  | 30  | 33  | 24  | 21  | 19  | 46  |
| 8                          |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 9                          |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 10                         |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 11                         | Distance to nearest receptor Metres:  | 6   | dB - | -16  | -16 | -16 | -16 | -16 | -16 | -16 | -16 | -16 | -16 |
| 12                         | $SPL=L1-20\log_{10}(r2/r1)$           | 1   |      |      |     |     |     |     |     |     |     |     |     |
| 13                         |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 14                         |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 15                         |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 16                         | Spl at receptor                       |     | dB + | 45   | 44  | 33  | 32  | 35  | 26  | 23  | 3   | 30  |     |
| 17                         |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 18                         |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 19                         | Façade correction                     | 3.0 | dB + | 3    | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   | 3   |
| 20                         | Natural Barrier                       | 10  | dB - | 10   | 10  | 10  | 10  | 10  | 10  | 10  | 10  | 10  | 10  |
| 21                         |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 22                         |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 23                         | Specific noise level at receptor      |     | dB + | 38   | 37  | 26  | 25  | 28  | 19  | 16  | -4  | 23  |     |
| 24                         | (1m outside noise sensitive window)   |     |      |      |     |     |     |     |     |     |     |     |     |
| 25                         | Background Noise Levels:( $L_{A90}$ ) |     |      |      |     |     |     |     |     |     |     |     |     |
| 26                         | Day time (07:00 - 23:00)              |     |      |      |     |     |     |     |     |     |     |     | 50  |
| 27                         | Difference: (Assessment level)        |     | dB - |      |     |     |     |     |     |     |     |     | -27 |
| 28                         |                                       |     |      |      |     |     |     |     |     |     |     |     |     |
| 29                         | Night-time (23:00-07:00)              |     |      |      |     |     |     |     |     |     |     |     | 29  |
| 30                         | Difference: (Assessment level)        |     | dB - |      |     |     |     |     |     |     |     |     | -6  |
|                            | E&OE                                  |     |      |      |     |     |     |     |     |     |     |     |     |

## APPENDIX C MEASUREMENTS

