



***Noise Impact Assessment of Plant Units Associated with a School Development***

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**Date:** 07/11/2022



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## Executive Summary

An environmental noise survey and noise impact assessment have been undertaken at Spurr House, Pole Lane, Bury, BL9 8QL to calculate the potential increase in noise levels from proposed plant equipment associated with a school development. The measured background sound levels have allowed for BS4142:2014 to be carried out. Further to this, an additional noise assessment has also been undertaken to ensure that the internal mechanical ventilation noise is within the BB93:2015 criteria.

The results of the assessments are summarised as follows:

### BS4142:2014 Assessment

The BS4142:2014 assessment indicates that provided the proposed plant equipment is installed as specified within this report, the rating noise level is not expected to exceed the prevailing background sound level at the most affected NSRs. This indicates 'Low Impact' in accordance with BS4142:2014 and 'No Observed Effect Level' (NOEL) when assessed with the NPSE and NPPF.

### Internal Noise Assessment

The internal noise levels in the most affected rooms are predicted to be 4 dB above the criteria. As such, it is recommended that silencers are installed directly after the intake and extract outputs from each system that are capable of providing the insertion losses shown Table 12.0.

Due to the higher ambient noise level criteria for rooms connected to the roof mounted ventilation systems (food room, science room, sports hall, gym and offices), silencers will not be required for these units.

## 1. Introduction

### **Overview**

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for plant equipment associated with a school development (the Proposed Development') at Spurr House, Pole Lane, Bury, BL9 8QL ('the Site').

This report details the existing background sound climate at the nearest receptors, as well as the sound emissions associated with the Proposed Development.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

### **Scope & Objectives**

The scope of the noise assessment can be summarised as follows:

- Baseline sound monitoring survey to evaluate the prevailing background sound levels at the nearest Noise Sensitive Receptor ('NSR') to Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with; ISO9613 – 1 ISO 9613-2 - Attenuation of sound during propagation outdoors prediction methodology, to predict sound levels at the NSR;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Policy Framework (2021), Noise Policy Statement for England (2010) and British Standard BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'. Further information on the legislation can be found in Appendix B.

## 2. Environmental Noise Survey

### Measurement Methodology

In order to characterise the sound profile of the area at the closest Noise Sensitive Receptors (NSRs), an environmental sound survey was carried out from 24/10/22 to 25/10/22. For the long-term monitoring, a sound level meter was attached to a lamppost adjacent to Pole Lane. The microphone of the sound level meter was located approximately 4m from the ground in order to avoid interference by the general public. The monitoring position was chosen in order to collect representative sound levels for the most affected NSRs during the typical operational periods of the fixed plant. The monitoring location is shown in Figure 1.0 below.



Figure 1.0 – Indicative Site Layout

### Context & Subjective Impression

The area surrounding the site is primarily residential in nature with a minority of commercial properties. The acoustic environment of the area would be classed as low/moderate in level and is dominated by road traffic noise emissions from the M66 motorway. To the north-east and south-east of the site are sports pitches. The closest Noise Sensitive Receptor (NSR1) is located approximately 45m to the west of the site on Pole Lane.

### Background

It is proposed that the existing care home is converted into an educational facility, which will be used as the new location for Spring Lane School.

It is intended for the following plant to be installed:

- 7no. Nuaire Xbox XBC – 65
- 2no. Mitsubishi PURY-300

**Environmental Noise Survey Results**

The client has specified that the plant will run exclusively during the operational period of the school. The table below outlines the sound levels measured during the daytime operational period that will be used as the baseline for the noise assessment.

A further summary of results for the entire measurement period and surveying equipment can be found in Appendix D.

| Measurement Position MP1 |                  |                                |
|--------------------------|------------------|--------------------------------|
| Measurement Period ('t') | $L_{Aeq,t}$ (dB) | 'Typical' $L_{A90,15min}$ (dB) |
| Operation Periods        | 59.0             | 56.0                           |

*Table 1.0 – Background Sound Level Summary Results*

The typical  $L_{A90,15min}$  is determined considering the distribution of measured levels during the operational period. A histogram is presented in Appendix D.

### 3. BS4142:2014 Noise Assessment

In the following section of the report, the noise generated by the plant units is compared with the prevailing background sound level to calculate the potential for noise impact at the closest NSRs.

#### Specific Noise Levels

The noise sources that will be externally mounted and ducted to the atmosphere are as follows:

- 2no. Mitsubishi PURY-300,
- 3no. Nuaire Xbox XBC – 65 Case Breakout (from externally mounted units),
- 7no. Nuaire Xbox XBC – 65 (discharge and supply from internally and externally mounted units).

The octave band and global sound power levels for the atmosphere side of a single Nuaire Xbox XBC – 65 system can be seen in the table below. To present a worst-case scenario, the noise levels are given for a system running at 100%.

| Nuaire Xbox XBC – 65 – Atmosphere Side |                                         |      |      |      |      |      |      |      |                                                 |
|----------------------------------------|-----------------------------------------|------|------|------|------|------|------|------|-------------------------------------------------|
| Description                            | Octave Band Sound Power Levels (Hz, dB) |      |      |      |      |      |      |      | Global Sound Power Level (L <sub>WA</sub> , dB) |
|                                        | 63                                      | 125  | 250  | 500  | 1k   | 2k   | 4k   | 8k   |                                                 |
| Supply (100%)                          | 83.0                                    | 85.0 | 79.0 | 74.0 | 72.0 | 68.0 | 61.0 | 54.0 | 78.0                                            |
| Discharge (100%)                       | 85.0                                    | 85.0 | 79.0 | 75.0 | 72.0 | 69.0 | 61.0 | 55.0 | 78.0                                            |
| Case Breakout (100%)                   | 71.0                                    | 69.0 | 56.0 | 51.0 | 45.0 | 41.0 | 35.0 | 20.0 | 56.0                                            |

Table 2.0 – Nuaire Xbox XBC – 65 Manufacturer's Noise Data

The noise output from a single Mitsubishi PURY-300 system taken from manufacturer's datasheet is shown in the table below.

| Mitsubishi PURY-300                              |                        |
|--------------------------------------------------|------------------------|
| Description                                      | (L <sub>WA</sub> , dB) |
| Sound Power Level of Mitsubishi PURY-300 at 100% | 86.0                   |

Table 3.0 – Mitsubishi PURY-300 Noise Data

*\*It should be noted that the final plant specification is not finalised. It is possible that the Mitsubishi PURY-300 units may be installed at ground level or on top of the flat roof. Further to this, it is unknown whether 1no. or 2no. will be installed, so to present a worst-case scenario, 2no. units will be used in the noise model.*

*The proposed plant locations are shown in the figure below.*

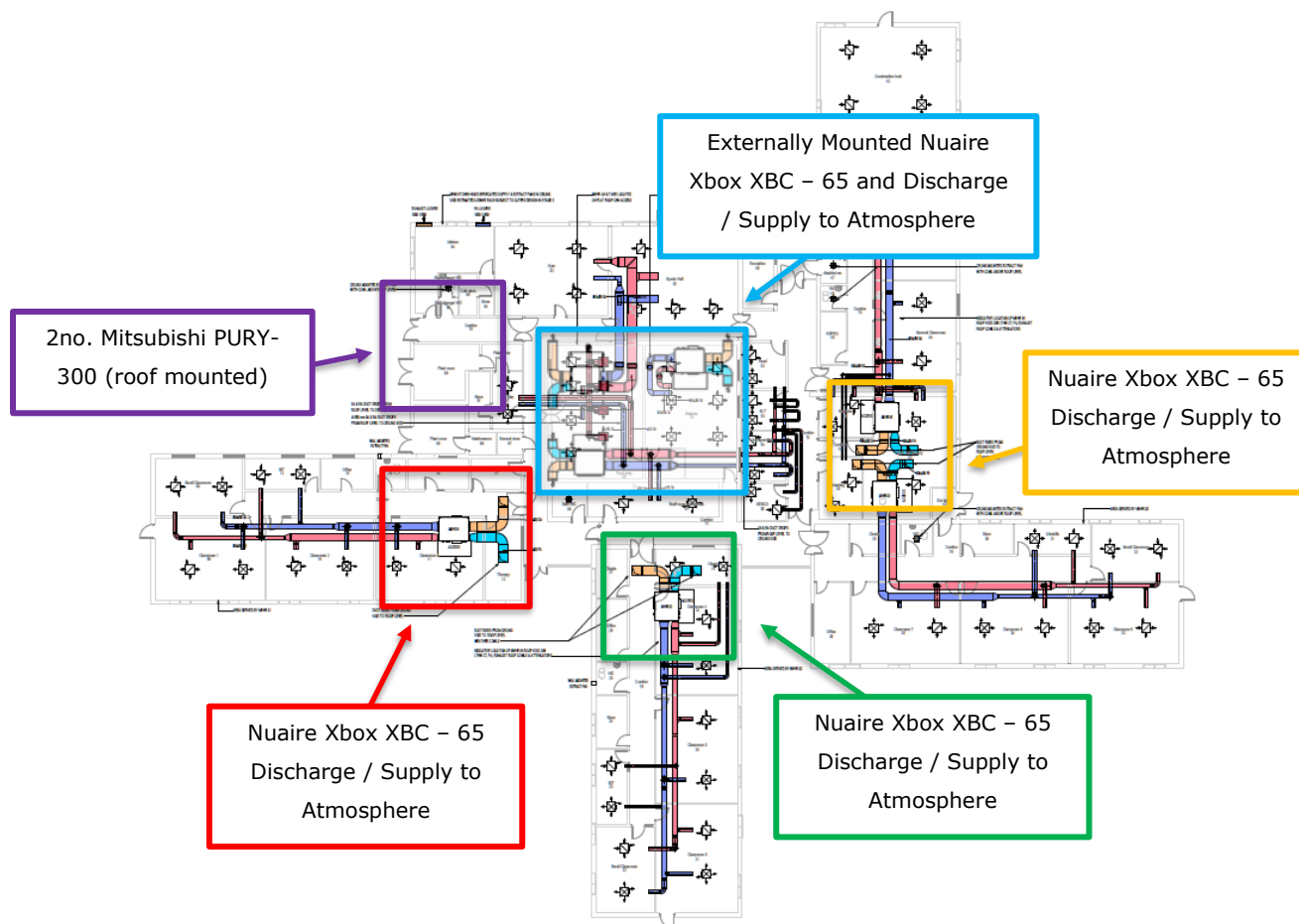


Figure 2.0 – External Plant Locations

### **Predictive Noise Modelling**

The specific sound level at the NSRs has been calculated using SoundPlan 8.2, which undertakes its calculations in accordance with the guidance given in ISO9613 – 1:1993 and ISO9613 – 2:1996.

The following assumptions have been made within the calculation software:

- To accurately model the land surrounding the development the topographical data has been taken from Google Maps, it is assumed this has an accuracy within the last 3 years.
- The ground between the source is a mix of acoustically 'soft' and 'hard' surfaces.
- The sound map below is shown at a grid height of 1.5m, however, the specific sound levels at the NSRs are taken from the most affected area of the façade, which could be any floor of the building.

The sound map showing the specific sound level emissions from the Proposed Development can be seen in the figure below.

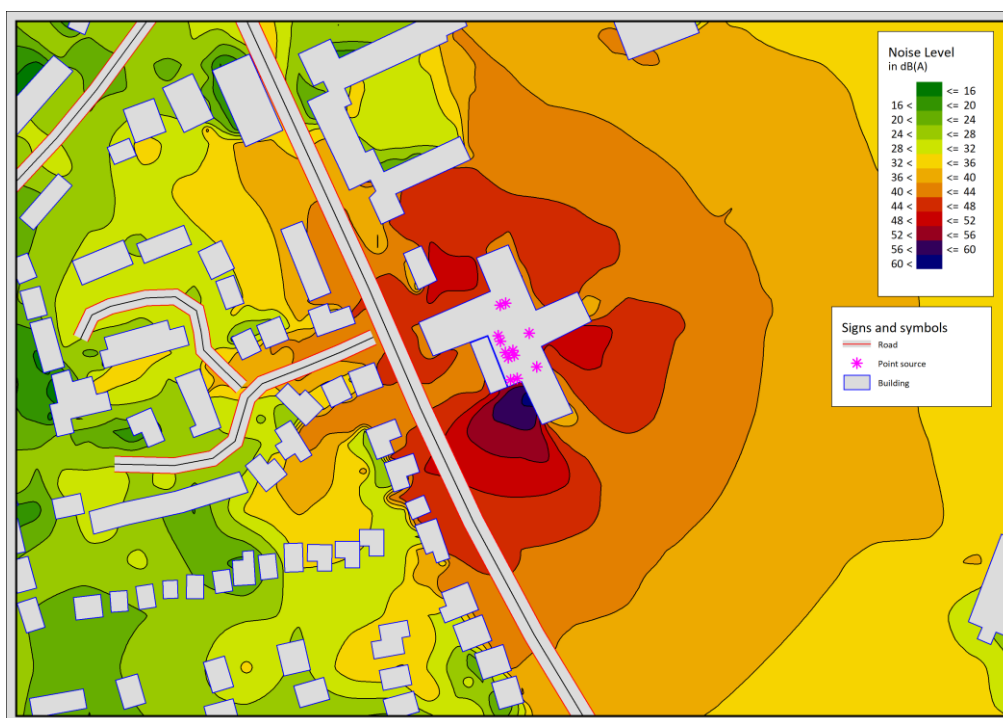


Figure 3.0 – Specific Sound Level Map

A summary of the specific sound levels at the most affected Noise Sensitive Receptors can be seen in the following table.

| NSR | Specific Sound Level (dBA) |
|-----|----------------------------|
| 1   | 45.0                       |
| 2   | 44.0                       |
| 3   | 47.0                       |

Table 4.0 – Specific Sound Level at NSR Summary

### Rating Penalty Assessment

In the following section, a rating penalty is defined and applied to the predicted specific noise levels.

| Rating Noise Levels |                                                     |                                       |                          |
|---------------------|-----------------------------------------------------|---------------------------------------|--------------------------|
| NSR                 | Specific Noise Level at the Most Exposed NSRs (dBA) | Acoustic Correction (dB)              | Rating Sound Level (dBA) |
| 1                   | 45.0                                                | Intermittency, +3.0<br>Tonality, +2.0 | 50.0                     |
| 2                   | 44.0                                                |                                       | 49.0                     |
| 3                   | 47.0                                                |                                       | 52.0                     |

Table 5.0 – Rating Noise Level at NSRs

*\*The minimum penalty is applied to account for just audible tonal components of the noise emissions. The plant equipment is likely to run intermittently, as such, a 3 dB penalty is also applied.*

### **BS4142:2014 – Noise Impact Assessment**

The BS4142 assessment of the proposed plant equipment at the most affected NSRs can be seen in the table below.

| <b>BS4142 Assessment</b>                        |                                   |                                   |                                   |
|-------------------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| <b>Results</b>                                  | <b>NSR1 Sound Level<br/>(dBA)</b> | <b>NSR2 Sound Level<br/>(dBA)</b> | <b>NSR3 Sound Level<br/>(dBA)</b> |
| Rating Sound Level                              | 50.0                              | 49.0                              | 52.0                              |
| Background Sound Level                          | 56.0                              | 56.0                              | 56.0                              |
| Excess of Rating over<br>Background Sound Level | -6.0                              | -7.0                              | -4.0                              |

*Table 6.0 – BS4142:2014 Noise Impact Assessment*

### **Discussion**

The assessment above indicates that the rating level does not exceed the background sound level at the most affected Noise Sensitive Receptors. This indicates 'Low Impact' when assessed with BS4142:2014 and 'No Observed Effect Level' (NOEL) when assessed with the NPPF and NPSE.

Given the outcome of the assessment, no further mitigation measures are required.

#### 4. Internal Ambient Noise Levels from Mechanical Ventilation

In the following section, the internal noise levels due to emissions from the mechanical ventilation systems will be assessed.

As per BB93:2015, noise from mechanical ventilation must not exceed the 'Indoor Ambient Noise Level' ('IANL') criteria shown in the table below. In order for the contributions from façade noise break-in and the background ventilation to not exceed the criteria, it is recommended that the ventilation noise is a minimum of 3 dB below the 'IANL' level.

| Type of Room       | BB93 Classification                                                                            | Indoor Ambient Noise Level (IANL)<br>( $L_{Aeq,30mins}$ dB) | Recommended Noise Limit for Mechanical Ventilation (dBA) |
|--------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------|
| Gen. Classroom     | Classroom                                                                                      | 40.0                                                        | 37.0                                                     |
| Food               | Food Technology                                                                                | 45.0                                                        | 42.0                                                     |
| Hair and Beauty    |                                                                                                |                                                             |                                                          |
| Art                |                                                                                                |                                                             |                                                          |
| Construction Tech  |                                                                                                |                                                             |                                                          |
| Library            | Library Quiet Study Area                                                                       | 45.0                                                        | 42.0                                                     |
| Office, Staffroom  | Office                                                                                         | 45.0                                                        | 42.0                                                     |
| Meeting Room       | Meeting Room                                                                                   | 45.0                                                        | 42.0                                                     |
| Therapy            | Teaching space intended specifically for students with special hearing and communication needs | 35.0                                                        | 32.0                                                     |
| Science Laboratory | Science Laboratory                                                                             | 45.0                                                        | 42.0                                                     |
| Kitchen            | Kitchen                                                                                        | 55.0                                                        | 52.0                                                     |
| Circulation        | Circulation Space                                                                              | 50.0                                                        | 47.0                                                     |
| Toilets / Changing | Changing Area, Toilet                                                                          | 55.0                                                        | 52.0                                                     |
| Sports Hall        | Sports Hall, Activity Studio                                                                   | 45.0                                                        | 42.0                                                     |
| Gym                |                                                                                                |                                                             |                                                          |

Table 7.0 – Internal Ambient Noise Level and Reverberation Criteria

The above levels may be relaxed by up to 5 dB when under the following conditions:

- "Intermittent boost – ventilation under local control of teacher for dilution of fumes during practical activities as in practical spaces for science, art, food technology and design and technology."

- "Summertime - ventilation under local control of teacher to prevent overheating – allowable during the hottest 200 hrs of the year."

However, where IANLs are 45 dB or greater, no relaxation should be applied.

### **Predicted Mechanical Ventilation Noise Emissions**

The octave band and global sound power levels for the room side of a single Nuaire Xbox XBC – 65 system can be seen in the table below.

| <b>Nuaire Xbox XBC – 65</b> |                                                |            |            |            |           |           |           |           |                                                      |
|-----------------------------|------------------------------------------------|------------|------------|------------|-----------|-----------|-----------|-----------|------------------------------------------------------|
| <b>Description</b>          | <b>Octave Band Sound Power Levels (Hz, dB)</b> |            |            |            |           |           |           |           | <b>Global Sound Power Level (L<sub>WA</sub>, dB)</b> |
|                             | <b>63</b>                                      | <b>125</b> | <b>250</b> | <b>500</b> | <b>1k</b> | <b>2k</b> | <b>4k</b> | <b>8k</b> |                                                      |
| Intake (75%)                | 73.0                                           | 73.0       | 66.0       | 60.0       | 58.0      | 53.0      | 42.0      | 28.0      | 64.0                                                 |
| Extract (75%)               | 75.0                                           | 73.0       | 64.0       | 61.0       | 58.0      | 54.0      | 42.0      | 29.0      | 64.0                                                 |
| Case Breakout (75%)         | 65.0                                           | 63.0       | 50.0       | 45.0       | 39.0      | 35.0      | 29.0      | 20.0      | 50.0                                                 |

*Table 8.0 – Nuaire Xbox XBC – 65 Manufacturer's Noise Data*

In order to assess whether attenuators are required, noise levels in the first classroom adjacent to each unit will be assessed. This is thought to present a worst-case scenario.

The following factors are considered in the calculations:

- There are two unlined 90-degree elbows between the Nuaire units and the intake/extract outlets/inlets.
- It is assumed that all mechanical ventilation will operate at 75% (or less) when operating at 'normal' levels. It is assumed the units will only operate at 100% whilst in 'boost' mode.
- All ducting is 250mm in diameter.
- All noise levels are calculated at a distance of 2m. It is thought this is likely to be the closest working position to the ducting outlets/inlets.
- The case breakout is predicted to be 35 dB at 2m in the room, however, as the units are to be installed within the suspended ceiling void, the sound reduction provided by the ceiling tiles must also be considered. Standard ceiling tiles are expected to provide a minimum weighted sound reduction of approximately 19 dB R<sub>w</sub> (min. surface mass of 3 kg/m<sup>2</sup>), meaning the case breakout noise is expected to be approximately 27 dB within the room. It must be ensured that the units are surrounded by mineral wool insulation in order to avoid reverberant build-up within the ceiling void.

The following figure shows the worst-case room location used for calculations.

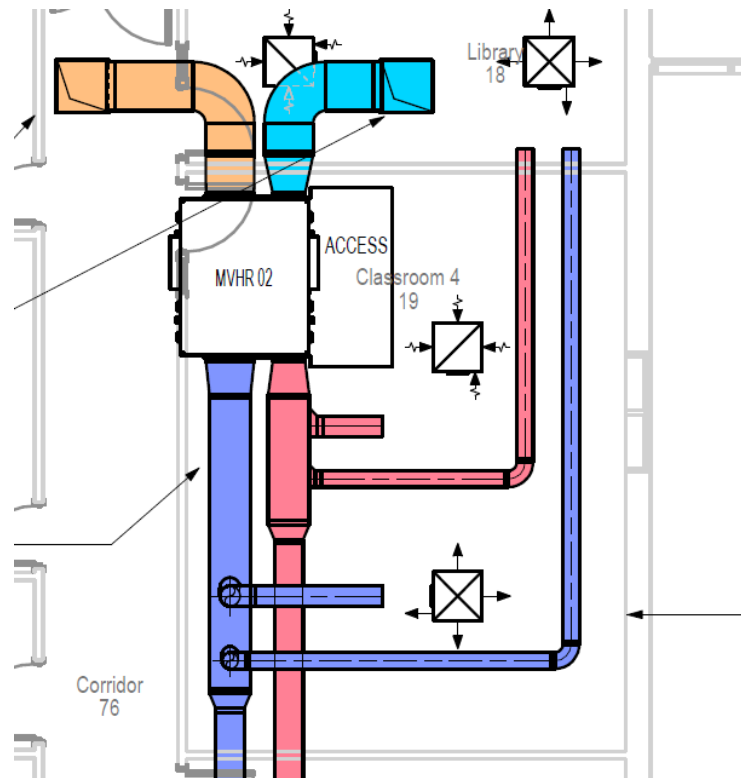


Figure 4.0 – Worst-Case Ventilation Layout

The following table shows the predicted internal noise levels without silencers installed.

| Intake Noise Calculations       |                                                 |       |       |       |       |       |       |       |
|---------------------------------|-------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Description                     | In-Duct Octave Band Sound Power Levels (Hz, dB) |       |       |       |       |       |       |       |
|                                 | 63                                              | 125   | 250   | 500   | 1k    | 2k    | 4k    | 8k    |
| L <sub>w</sub> of Intake (75%)  | 73.0                                            | 73.0  | 66.0  | 60.0  | 58.0  | 53.0  | 42.0  | 28.0  |
| Uncertainties                   | +3.0                                            | +3.0  | +3.0  | +3.0  | +3.0  | +3.0  | +3.0  | +3.0  |
| Room and Terminal Effect        | -4.0                                            | -4.0  | -4.0  | -4.0  | -4.0  | -4.0  | -4.0  | -4.0  |
| Allowance for End Reflection    | -12.0                                           | -8.0  | -4.0  | -1.0  | 0.0   | 0.0   | 0.0   | 0.0   |
| 2no. Elbow Attenuation          | 0.0                                             | 0.0   | 0.0   | -10.0 | -16.0 | -8.0  | -6.0  | -6.0  |
| 1no. Parallel Split             | -3.0                                            | -3.0  | -3.0  | -3.0  | -3.0  | -3.0  | -3.0  | -3.0  |
| A-weighting                     | -26.0                                           | -16.0 | -9.0  | -3.0  | 0.0   | +1.0  | +1.0  | +1.0  |
| Resulting L <sub>WA</sub>       | 31.0                                            | 45.0  | 49.0  | 42.0  | 38.0  | 42.0  | 33.0  | 19.0  |
| Hemi-Spherical Propagation (2m) | -14.0                                           | -14.0 | -14.0 | -14.0 | -14.0 | -14.0 | -14.0 | -14.0 |
| L <sub>PA</sub> at 2m           | 38.0                                            |       |       |       |       |       |       |       |

Table 9.0 – Predicted Internal Noise from Intake

| Extract Noise Calculations      |                                                 |       |       |       |       |       |       |       |
|---------------------------------|-------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Description                     | In-Duct Octave Band Sound Power Levels (Hz, dB) |       |       |       |       |       |       |       |
|                                 | 63                                              | 125   | 250   | 500   | 1k    | 2k    | 4k    | 8k    |
| L <sub>w</sub> of Extract (75%) | 75.0                                            | 73.0  | 64.0  | 61.0  | 58.0  | 54.0  | 42.0  | 29.0  |
| Uncertainties                   | +3.0                                            | +3.0  | +3.0  | +3.0  | +3.0  | +3.0  | +3.0  | +3.0  |
| Room and Terminal Effect        | -4.0                                            | -4.0  | -4.0  | -4.0  | -4.0  | -4.0  | -4.0  | -4.0  |
| Allowance for End Reflection    | -12.0                                           | -8.0  | -4.0  | -1.0  | 0.0   | 0.0   | 0.0   | 0.0   |
| 2no. Elbow Attenuation          | 0.0                                             | 0.0   | 0.0   | -10.0 | -16.0 | -8.0  | -6.0  | -6.0  |
| 1no. Parallel Split             | -3.0                                            | -3.0  | -3.0  | -3.0  | -3.0  | -3.0  | -3.0  | -3.0  |
| A-weighting                     | -26.0                                           | -16.0 | -9.0  | -3.0  | 0.0   | +1.0  | +1.0  | +1.0  |
| Resulting L <sub>WA</sub>       | 33.0                                            | 45.0  | 47.0  | 43.0  | 38.0  | 43.0  | 33.0  | 20.0  |
| Hemi-Spherical Propagation (2m) | -14.0                                           | -14.0 | -14.0 | -14.0 | -14.0 | -14.0 | -14.0 | -14.0 |
| L <sub>PA</sub> at 2m           | <b>37.0</b>                                     |       |       |       |       |       |       |       |

Table 10.0 – Predicted Internal Noise from Extract

| Cumulative Noise Level |                            |
|------------------------|----------------------------|
| Description            | Specific Sound Level (dBA) |
| Intake                 | 38.0                       |
| Extract                | 37.0                       |
| Case Breakout          | 27.0                       |
| Cumulative             | 41.0                       |
| Criteria               | ≤37.0                      |
| Level Above Criteria   | +4.0                       |

Table 11.0 – Cumulative Noise Level

### Discussion

As can be seen in the table above, the internal noise levels are predicted to be 4 dB above the criteria. As such, it is recommended that silencers are installed directly after the intake and extract outputs from each system that are capable of providing the insertion losses shown in the following table.

Due to the higher ambient noise level criteria for rooms connected to the 3no. roof mounted ventilation systems (food room, science room, sports hall, gym and offices), silencers will not be required for these units.

| Required Insertion Losses         |                                                 |      |      |      |     |      |     |     |
|-----------------------------------|-------------------------------------------------|------|------|------|-----|------|-----|-----|
| Description                       | In-Duct Octave Band Sound Power Levels (Hz, dB) |      |      |      |     |      |     |     |
|                                   | 63                                              | 125  | 250  | 500  | 1k  | 2k   | 4k  | 8k  |
| Intake – Required Insertion Loss  | 0.0                                             | -5.0 | -9.0 | -5.0 | 0.0 | -5.0 | 0.0 | 0.0 |
| Extract – Required Insertion Loss | 0.0                                             | -5.0 | -7.0 | -5.0 | 0.0 | -5.0 | 0.0 | 0.0 |

*Table 12.0 – Required Silencer Insertion Losses*

## Appendix A – Acoustic Terminology

|                                    |                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sound Pressure                     | Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.                                                                                                                                                                                                                                                                                    |
| Sound Pressure Level (Sound Level) | The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 <sup>-6</sup> Pascals) on a decibel scale.                                                                                                                                                                                                                                      |
| Decibel (dB)                       | A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log <sub>10</sub> (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa. |
| A-weighting, dB(A)                 | The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.                                                                                                                                                                                                                            |
| Noise Level Indices                | Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.                                                                                                 |
| L <sub>eq,T</sub>                  | A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.                                                                                                                          |
| L <sub>max,T</sub>                 | A noise level index defined as the maximum noise level during the period T. L <sub>max</sub> is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L <sub>eq</sub> noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.       |
| L <sub>90,T</sub>                  | A noise level index. The noise level exceeded for 90% of the time over the period T. L <sub>90</sub> can be considered to be the "average minimum" noise level and is often used to describe the background noise.                                                                                                                                                              |
| L <sub>10,T</sub>                  | A noise level index. The noise level exceeded for 10% of the time over the period T. L <sub>10</sub> can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.                                                                                                                                                                  |
| Free-Field                         | Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m                                                                                                                                                                                                                                                                      |
| Facade                             | At a distance of 1m in front of a large sound reflecting object such as a building façade.                                                                                                                                                                                                                                                                                      |
| Fast Time Weighting                | An averaging time used in sound level meters. Defined in BS 5969.                                                                                                                                                                                                                                                                                                               |

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale

typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

| Sound Level     | Location                   |
|-----------------|----------------------------|
| 0dB(A)          | Threshold of hearing       |
| 20 to 30dB(A)   | Quiet bedroom at night     |
| 30 to 40dB(A)   | Living room during the day |
| 40 to 50dB(A)   | Typical office             |
| 50 to 60dB(A)   | Inside a car               |
| 60 to 70dB(A)   | Typical high street        |
| 70 to 90dB(A)   | Inside factory             |
| 100 to 110dB(A) | Burglar alarm at 1m away   |
| 110 to 130dB(A) | Jet aircraft on take off   |
| 140dB(A)        | Threshold of Pain          |

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the  $L_{A10}$ , the noise level exceeded for 10% of the measurement period. The  $L_{A90}$  is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level,  $L_{Aeq}$ .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is

predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as  $L_{A90,1\text{hour}}$  dB and  $L_{A90,15\text{mins}}$  dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.

## Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

### B.1 – National Planning Policy Framework (2021)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2021. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 174e, it states:

*Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;*

Paragraph 185 states:

*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

- a) Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

### B.2 – Noise Policy Statement for England (2010)

Paragraph 185 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

*Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.*

To achieve this vision the Statement identifies the following three aims:

*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- Avoid significant adverse impacts on health and quality of life;*
- Mitigate and minimise adverse impacts on health and quality of life;*
- Where possible, contribute to the improvement of health and quality of life.*

In achieving these aims the document introduces significance criteria as follows:

**SOAEL – Significant Observed Adverse Effect Level**

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

**LOAEL – Lowest Observed Adverse Effect Level**

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

**NOEL – No Observed Effect Level**

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. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

***B.3 – British Standard BS4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound*****Overview**

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the  $L_{Aeq,T}$  ‘specific sound level’, immediately outside the dwelling with the  $L_{A90,T}$  background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the  $L_{A,r,T}$  ‘rating sound level’. A correction to include the

consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

### **Rating Penalty**

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

*"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:*

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method."*

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

*"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."*

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

#### *a) Tonality*

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

#### *b) Impulsivity*

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

#### *c) Other Sound Characteristics*

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."

#### *d) Intermittency*

BS4142:2014 states that when the "specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time

interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."

### ***Background Sound Level***

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a 'typical' background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, 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.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

### ***Assessment of Impact***

BS4142:2014 states: "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 occurs". An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

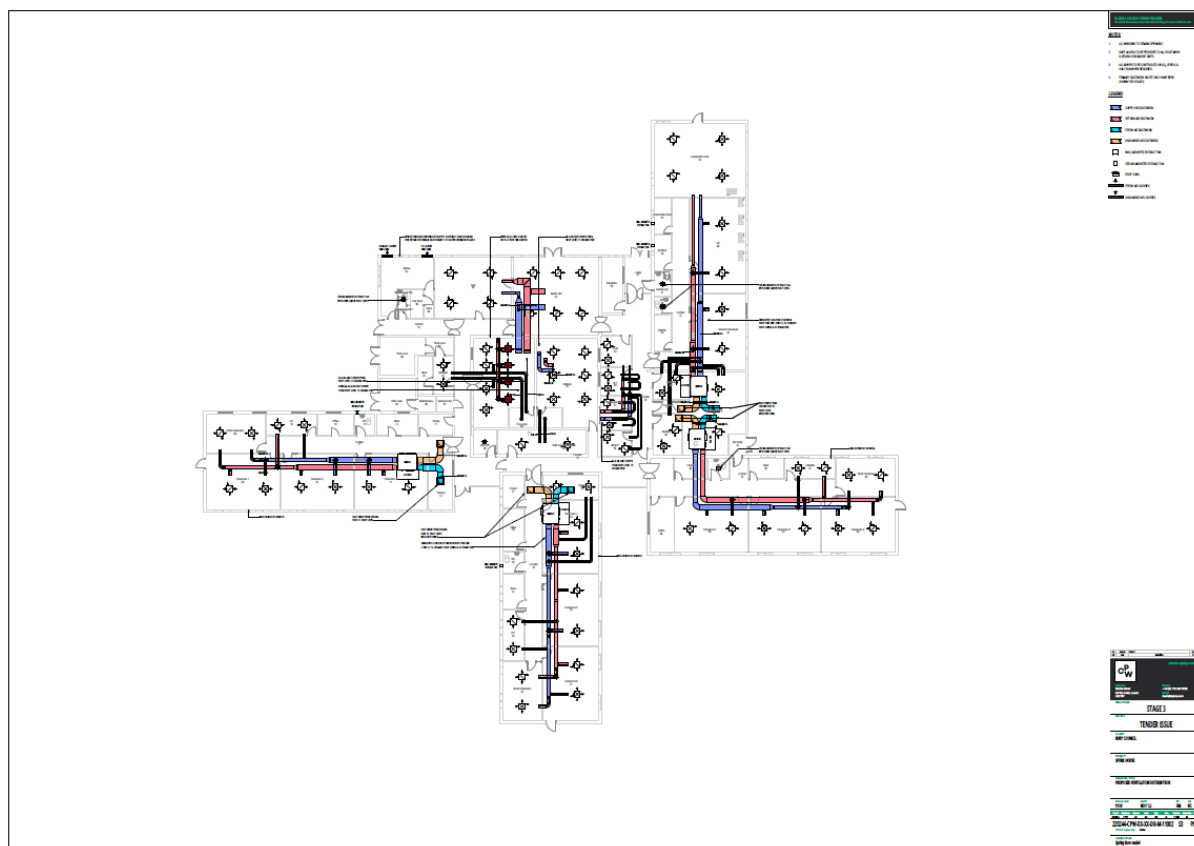
- "Typically, the greater this difference, the greater the magnitude of the impact."
- "A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."
- "A difference of around +5dB is likely to be an indication of an adverse impact, depending 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 negligible impact, depending on the context."

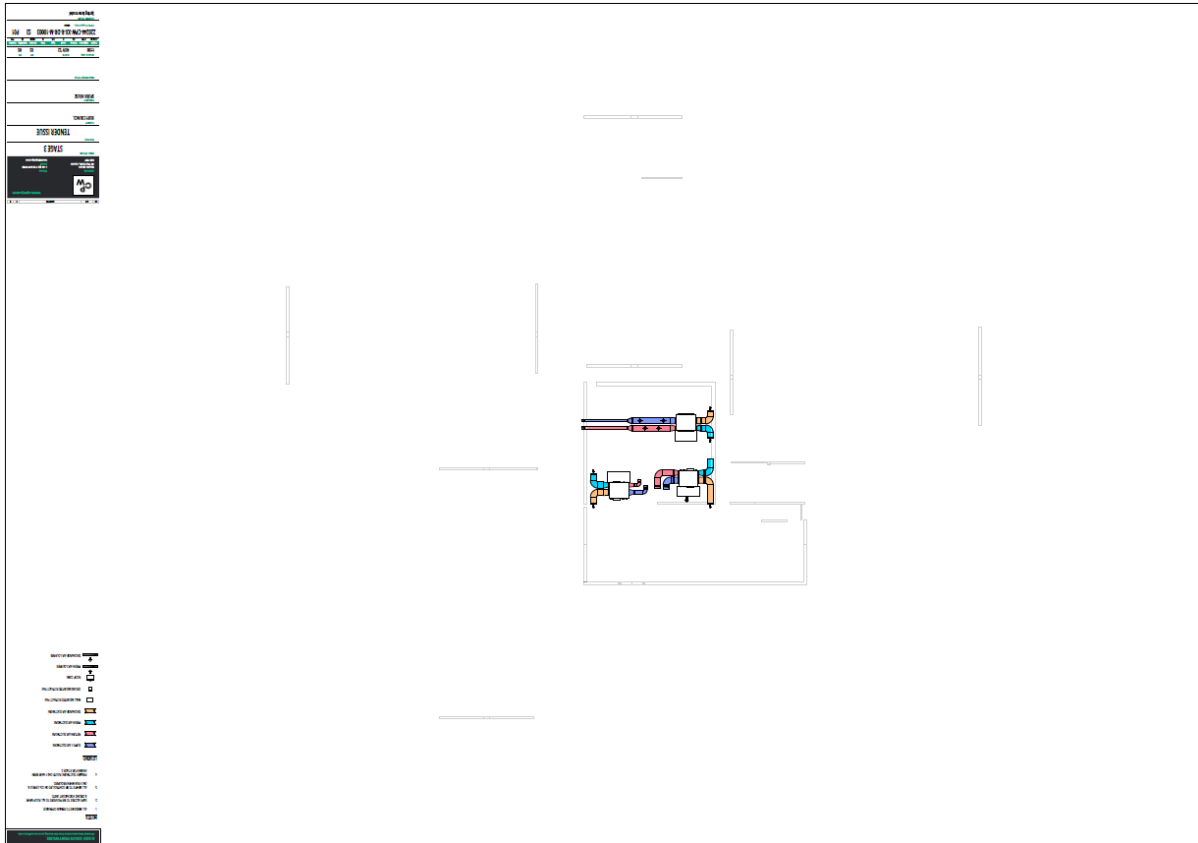
Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;

- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact and would therefore be classified as a No Observed Adverse Effect Level.

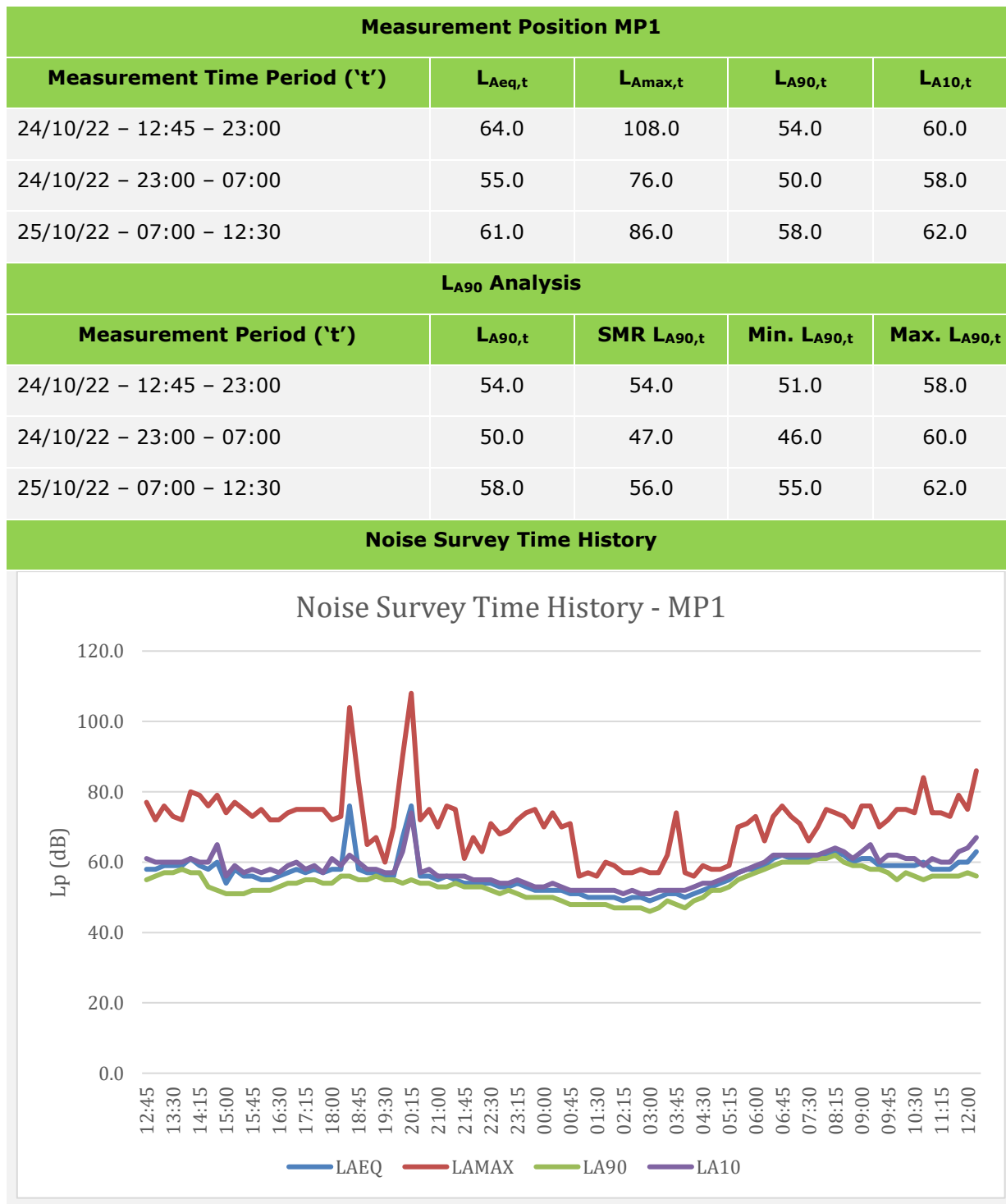
During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

[illegible]



## Appendix D – Environmental Survey

### D.1 – Tabulated Summary Noise Data



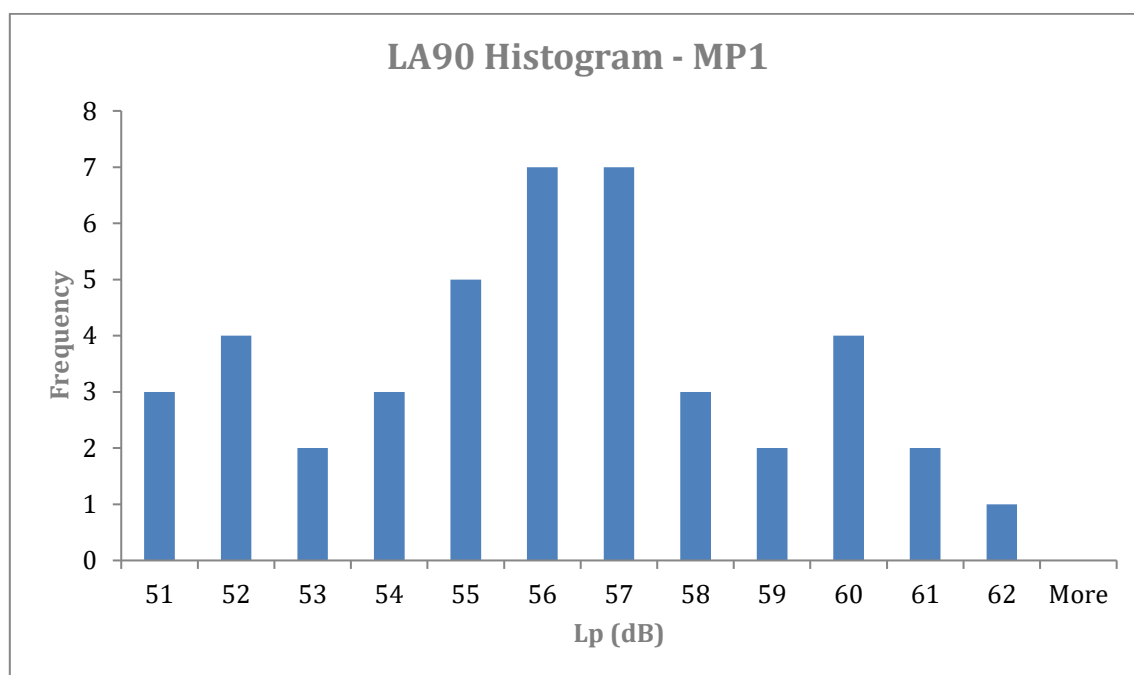


Figure 5.0 –  $L_{A90}$  Histogram

## D.2 – Surveying Equipment

| Piece of Equipment                    | Serial No. | Calibration Deviation |
|---------------------------------------|------------|-----------------------|
| CESVA SC420 Class 1 Sound Level Meter | T250681    | $\leq 0.5$            |
| CESVA CB006 Class 1 Calibrator        | 902442     |                       |

Table 14.0 – Measurement Equipment

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. Calibration certificates can be provided upon request.

## D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and 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 – Roe Green – Approx. 9km South-West of Site |                  |                    |                     |                   |
|-----------------------------------------------------------------|------------------|--------------------|---------------------|-------------------|
| Time Period                                                     | Air Temp<br>(°C) | Rainfall<br>(mm/h) | Wind Speed<br>(m/s) | Wind<br>Direction |
| 24/10/22 – 00:00 – 23:59                                        | 10.1 – 14.6      | 0.0 – 1.8          | SSW                 | 0.0 – 2.6         |
| 25/10/22 – 00:00 – 23:59                                        | 8.4 – 16.5       | 0.0 – 1.8          | SSE                 | 0.0 – 4.5         |

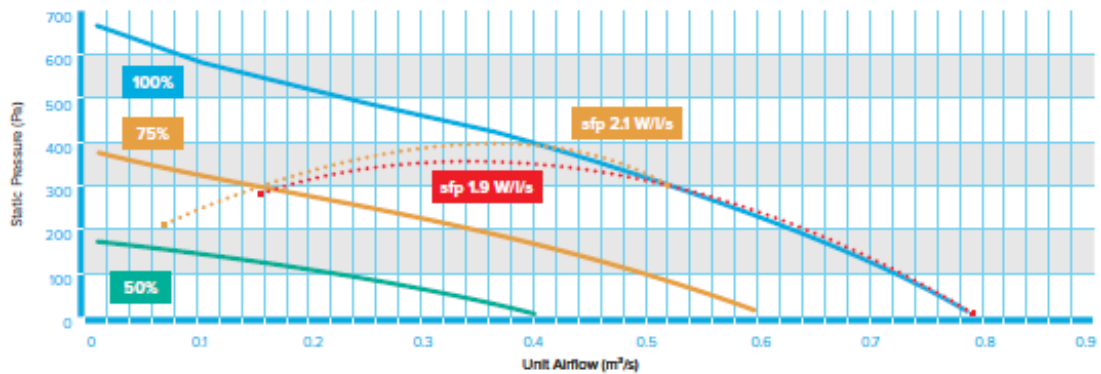
*Table 15.0 – Meteorological Data*

## Appendix E – Manufacturer's Datasheets

### XBOXER XBC+ 65

#### PERFORMANCE & TECHNICAL INFORMATION

PERFORMANCE CHART



TECHNICAL INFORMATION

| HEATER TYPE | VOLTAGE | PHASE | FREQUENCY | INPUT POWER (W) | FAN SPEED (rpm) | FLC (A) | SC (A) | MAX OPERATING TEMPERATURE (°C) | UNIT WEIGHT (kg) |
|-------------|---------|-------|-----------|-----------------|-----------------|---------|--------|--------------------------------|------------------|
| LPHW        | 230     | 1     | 50        | 1540            | 1700            | 8       | 8      | 40                             | 469              |
| Electric*   | 230     | 1     | 50        | 10540           | 1700            | 47      | 47     | 40                             | 476              |
| None        | 230     | 1     | 50        | 1540            | 1700            | 8       | 8      | 40                             | 465              |

Relevant to BC, ES, CO or AT control types. \*Includes 9kW electric heater.

SOUND DATA

| FAN SPEED | SOUND POWER LEVELS (dB re 1 pW) | FREQUENCY (Hz) |     |     |     |    |    |    |     | SPHERICAL dBA@3m |
|-----------|---------------------------------|----------------|-----|-----|-----|----|----|----|-----|------------------|
|           |                                 | 63             | 125 | 250 | 500 | 1K | 2K | 4K | 8K  |                  |
| 100%      | Induct Intake                   | 79             | 79  | 72  | 66  | 64 | 59 | 48 | 34  | 35               |
|           | Induct Supply                   | 83             | 85  | 79  | 74  | 72 | 68 | 61 | 54  |                  |
|           | Induct Discharge                | 85             | 85  | 79  | 75  | 72 | 69 | 61 | 55  |                  |
|           | Induct Extract                  | 81             | 79  | 70  | 67  | 64 | 60 | 48 | 35  |                  |
|           | Casing Radiated                 | 71             | 69  | 56  | 51  | 45 | 41 | 35 | 20  |                  |
| 75%       | Induct Intake                   | 73             | 73  | 66  | 60  | 58 | 53 | 42 | 28  | 29               |
|           | Induct Supply                   | 77             | 79  | 73  | 68  | 66 | 62 | 55 | 48  |                  |
|           | Induct Discharge                | 79             | 79  | 73  | 69  | 66 | 63 | 55 | 49  |                  |
|           | Induct Extract                  | 75             | 73  | 64  | 61  | 58 | 54 | 42 | 29  |                  |
|           | Casing Radiated                 | 65             | 63  | 50  | 45  | 39 | 35 | 29 | <20 |                  |
| 50%       | Induct Intake                   | 64             | 64  | 57  | 51  | 49 | 44 | 33 | <20 | 20               |
|           | Induct Supply                   | 68             | 70  | 64  | 59  | 57 | 53 | 46 | 39  |                  |
|           | Induct Discharge                | 70             | 70  | 64  | 60  | 57 | 54 | 46 | 40  |                  |
|           | Induct Extract                  | 66             | 64  | 55  | 52  | 49 | 45 | 33 | 20  |                  |
|           | Casing Radiated                 | 56             | 54  | 41  | 36  | 30 | 26 | 20 | <20 |                  |

## Air Conditioning Product Information

## R2 Series VRF

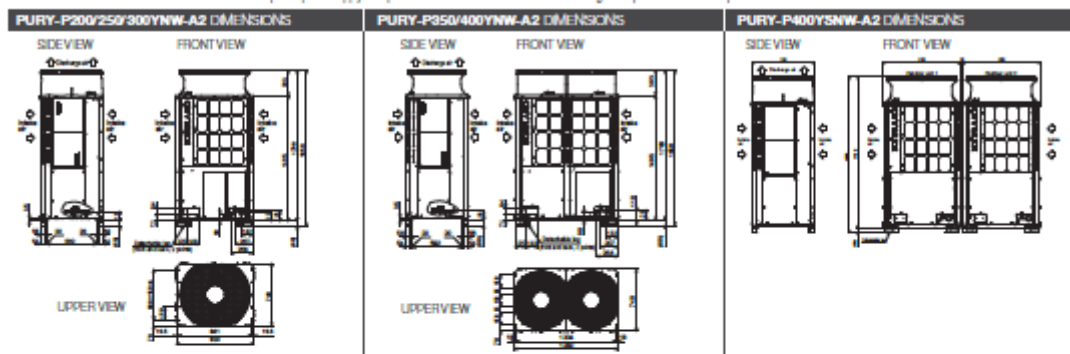
Standard Efficiency (22.4-45kW)

Simultaneous Heating and Cooling with Heat Recovery Outdoor Unit



| OUTDOOR UNITS                                                                        |                               | PURY-P200YMW-A2       | PURY-P250YMW-A2       | PURY-P300YMW-A2       | PURY-P350YMW-A2       | PURY-P400YMW-A2       | PURY-P400YSNW-A2          |
|--------------------------------------------------------------------------------------|-------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------------|
| CAPACITY (kW)                                                                        | Heating (nominal)             | 25.0                  | 31.5                  | 39.8                  | 45.0                  | 50.0                  | 50.0                      |
|                                                                                      | Cooling (nominal)             | 22.4                  | 28.0                  | 35.0                  | 40.0                  | 45.0                  | 44.8                      |
|                                                                                      | High Performance Heating (kW) | 25.0                  | 31.5                  | 39.8                  | 42.8                  | 45.0                  | 50.0                      |
|                                                                                      | COP Priority Heating (kW)     | 22.8                  | 26.7                  | 33.1                  | 41.0                  | 43.0                  | 45.5                      |
|                                                                                      | Cooling (kW)                  | 20.0                  | 25.1                  | 30.0                  | 35.8                  | 40.3                  | 40.1                      |
| POWER INPUT (kW)                                                                     | Heating (nominal)             | 6.70                  | 9.57                  | 11.87                 | 13.88                 | 15.66                 | 14.00                     |
|                                                                                      | Cooling (nominal)             | 6.68                  | 10.25                 | 11.75                 | 14.32                 | 15.85                 | 13.78                     |
|                                                                                      | High Performance Heating (kW) | 8.56                  | 12.06                 | 12.79                 | 18.46                 | 18.90                 | 17.92                     |
|                                                                                      | COP Priority Heating (kW)     | 6.70                  | 9.57                  | 11.87                 | 13.88                 | 15.76                 | 14.00                     |
|                                                                                      | Cooling (kW)                  | 3.87                  | 5.35                  | 6.83                  | 8.05                  | 12.58                 | 7.99                      |
| COP / EER (nominal)                                                                  |                               | 3.68 / 3.35           | 3.29 / 2.73           | 3.40 / 2.85           | 3.24 / 2.68           | 3.00 / 2.30           | 3.57 / 3.25               |
| SCOP / SEER                                                                          |                               | -                     | -                     | -                     | -                     | -                     | -                         |
| MAX NO. OF CONNECTABLE INDOOR UNITS                                                  |                               | 20                    | 25                    | 30                    | 35                    | 40                    | 40                        |
| MAX. CONNECTABLE CAPACITY                                                            |                               | 50-150% O.U. Capacity | 50-150% O.U. Capacity | 50-150% O.U. Capacity | 50-150% O.U. Capacity | 50-150% O.U. Capacity | 50-150% O.U. Capacity     |
| AIRFLOW (m³/min)                                                                     | High                          | 170                   | 220                   | 240                   | 250                   | 315                   | 170 / 170                 |
|                                                                                      | Low                           | 150                   | 190                   | 210                   | 220                   | 280                   | 150 / 150                 |
| PIPE SIZE (mm) (in)                                                                  | Gas                           | 15.0 (3/4")           | 22.2 (7/8")           | 25.4 (1")             | 25.4 (1")             | 25.4 (1")             | 25.4 (1")                 |
|                                                                                      | Liquid                        | 15.0 (3/4")           | 19.0 (3/4")           | 19.0 (3/4")           | 19.0 (3/4")           | 19.0 (3/4")           | 19.0 (3/4")               |
| SOUND PRESSURE LEVEL (dB(A) @ 1m)                                                    |                               | 59.0 / 59.0           | 64.0 / 60.0           | 67.0 / 61.0           | 64.0 / 62.0           | 69.0 / 65.0           | 62.0 / 62.0               |
| SOUND POWER LEVEL (dB(A) @ 10% CAPACITY)                                             |                               | 76.0 / 76.0           | 80.0 / 76.0           | 86.0 / 80.0           | 83.0 / 81.0           | 88.0 / 83.0           | 79.0 / 79.0               |
| SOUND POWER LEVEL (dB(A) @ 50% CAPACITY)                                             |                               | - / 71.0              | 81.0 / 73.5           | 78.5 / 74.5           | 81.0 / 76.0           | 81.0 / 77.0           | - / 74.0                  |
| SOUND POWER LEVEL (dB(A) @ 75% CAPACITY)                                             |                               | - / 66.5              | 77.0 / 69.5           | 74.5 / 70.5           | 77.0 / 73.0           | 75.0 / 73.0           | - / 69.5                  |
| WEIGHT (kg)                                                                          | Heating / Cooling             | 214                   | 223                   | 225                   | 269                   | 269                   | 214 + 214                 |
|                                                                                      | Heating / Cooling             | 214                   | 223                   | 225                   | 269                   | 269                   | 214 + 214                 |
|                                                                                      | Heating / Cooling             | 214                   | 223                   | 225                   | 269                   | 269                   | 214 + 214                 |
| DIMENSIONS (mm)                                                                      |                               |                       |                       |                       |                       |                       |                           |
| ELECTRICAL SUPPLY*                                                                   | Width                         | 925                   | 925                   | 925                   | 1340                  | 1340                  | 925 + 925                 |
|                                                                                      | Depth                         | 740                   | 740                   | 740                   | 740                   | 740                   | 740                       |
|                                                                                      | Height                        | 1858                  | 1858                  | 1858                  | 1858                  | 1858                  | 1858                      |
| ELECTRICAL SUPPLY*                                                                   |                               | 380-415V, 50Hz        | 380-415V, 50Hz        | 380-415V, 50Hz        | 380-415V, 50Hz        | 380-415V, 50Hz        | 380-415V, 50Hz            |
| PHASE*                                                                               |                               | Three                 | Three                 | Three                 | Three                 | Three                 | Three                     |
| STARTING CURRENT (A)*                                                                |                               | 8                     | 8                     | 8                     | 8                     | 8                     | 8                         |
| NOMINAL SYSTEM RUNNING CURRENT (A)*                                                  |                               | 10.8 / 10.7 (16.1)    | 15.3 / 16.4 (21.4)    | 18.4 / 18.8 (26.4)    | 22.7 / 23.9 (27.6)    | 25.7 / 31.5 (35.1)    | 22.4 / 22.0 (16.1 + 16.1) |
| GUARANTEED OPERATING RANGE (°C)                                                      |                               | -30-15.5 / -5-52      | -30-15.5 / -5-52      | -30-15.5 / -5-52      | -30-15.5 / -5-52      | -30-15.5 / -5-52      | -30-15.5 / -5-52          |
| FUSE RATING (MCA) (BS EN 60947-2) - (A)*                                             |                               | 1x 20                 | 1x 25                 | 1x 25                 | 1x 32                 | 1x 40                 | 1x 20 / 1x 20             |
| MAINS CABLE No. Core*                                                                |                               | 4 + earth             | 4 + earth             | 4 + earth             | 4 + earth             | 4 + earth             | 4 + earth / 4 + earth     |
| CHARGE REFRIGERANT (kg) / CO <sub>2</sub> EQUIVALENT (T) (R410A (GWP 2088))          |                               | 5.27 / 10.9           | 5.27 / 10.9           | 5.27 / 10.9           | 8.7 / 16.7            | 8.7 / 16.7            | 10.4 / 21.7               |
| MAX. ADDITIONAL REFRIGERANT (kg) / CO <sub>2</sub> EQUIVALENT (T) (R410A (GWP 2088)) |                               | 31.8 / 66.4           | 37.8 / 76.9           | 37.8 / 76.9           | 41.3 / 86.2           | 47.3 / 98.8           | 60.6 / 126.5              |

Notes: COP / EER is calculated method to EN14825. \* A separate power supply is required for each module. Where more than one figure is quoted there are multiple modules.



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Note: Refer to 'Installation Manual' and 'Instruction Book' for further 'Technical Information'. The fuse rating is for guidance only and please refer to the relevant datasheet for detailed specification. It is the responsibility of a qualified electrical/electronic engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP=2088), R32 (GWP=675), R407C (GWP=1774), R134a (GWP=1430), R152A (GWP=68), R454B (GWP=466), R1234ze (GWP=7) or R1234yf (GWP=4). These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No 1236/2014 from IPCC 4th edition, these are as follows: R410A (GWP=1810), R32 (GWP=675), R407C (GWP=1810) or R134a (GWP=1300).

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