

**REPORT TITLE:**

**Fontwell, Arundel Rd, BN18 0SB - Filing Station: Environmental noise assessment**

**CLIENT DETAILS:**

**Allan B. Matthews R.I.B.A**

**DATE:**

**4<sup>th</sup> October 2018**

**REPORT REFERENCE:**

**PC-18-0262-RP1-RevD**

**PREPARED BY:**

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# 1. Introduction

Pace Consult has been commissioned to review the noise impact of proposed outdoor units in support of the planning application for a proposed development comprising:

- Replacement sales building.
- Canopy link removed.
- New bin store, delivery bay, front of store customer parking, replacement of condensers & 2 No new electric charging points.

The above are taking place in a Shell filling station located in Arundel Rd, BN18 0SB. The development is subject to the following conditions as mandated by the Arun District Council:

*(3) All plant, machinery and equipment installed or operated in connection with the carrying out of this permission shall be so enclosed and/or attenuated so that the rating level of noise emitted does not exceed the background sound level, when measured according to British Standard BS4142: 2014 at any adjoining or nearby noise sensitive premises.*

*(4) Details, including acoustic specifications, of all fixed plant, machinery and equipment associated with air moving equipment [(including fans, ducting and external openings)], compressors, generators or plant or equipment of a like kind, installed within the site which has the potential to cause noise disturbance to any noise sensitive receivers, shall be submitted to and approved by the local planning authority before installation. The rating level of noise emitted from the use of this plant, machinery or equipment shall not exceed the background sound level when measured according to British Standard BS4142: 2014, at any adjoining or nearby noise sensitive premises.*

The assessment has considered the most relevant guidelines and standards, including BS 4142:2014, *Methods for rating and assessing industrial and commercial sound*.

Equipment that is considered in this study consists of outdoor units; namely:

- 2 x PUHZ125 (by Mitsubishi)
- 3 x OP-MPL044VVLP01E (by Danfoss)
- 3 x CM08 Z.C4.MLZ-015 (by KARYER)
- 1 x MUZ-SF25VE (by Mitsubishi)

To the best of our knowledge there are no items apart from the above that are expected to produce noise and require our attention.

Weather during the measurements was noted to be:

- Temperature: 18/10 °C
- Humidity: 82%
- Wind: ~0 mph

## 2. Design Criteria

### 2.1 BS4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound

BS4142 has recently been revised and the 1997 edition has been replaced. The standard sets out a methodology for the assessment of whether noise from factories, industrial premises or fixed installations and sources of an industrial/commercial nature.

The procedure contained in BS4142 for assessing the likelihood of complaints is to compare the measured or predicted noise level from the source in question, the 'specific noise level', at the assessment position with the correct background noise level for the worst case time of operation.

Where the noise contains a 'distinguishable, discreet, continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks or clatters), or if the noise is irregular enough to attract attention' then a range of correction factors can be added to the specific noise level as appropriate to obtain the 'rating level'.

As this is a prescriptive report prior to equipment installation, overall rating noise levels will be specified for the new installation. Compliance with the rating value will be necessary to provide evidence that significant adverse impact has been avoided as required by the NPSE.

To assess the likelihood of complaints, the measured background noise level is subtracted from the rating noise level. BS4142 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 effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessment and arriving at decisions, therefore, it is essential to place the sound in context.*

*Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (See Clause 8) from the rating level (see Clause 9) and consider the following.*

- a) Typically the greater the difference, the greater the magnitude of the impact.*
- b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- c) A difference of around 5dB is likely to be an indication of an adverse impact, depending on the context.*
- d) 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.*

*Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.*

- 1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night*

*Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.*

- 2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.*
- 3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as;*
  - i) Façade sound insulation treatment*
  - ii) Ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
  - iii) Acoustic screening.*

In summary, the BS4142: 2014, 'Methods for rating and assessing industrial and commercial sound' would indicate that compliance with the wider aims of the NPSE is achieved when a rating level does not exceed the background sound level for the given time of operation.

## 2.2 Noise survey

Noise measurements were undertaken in free-field conditions between Wednesday 29<sup>th</sup> and Thursday 30<sup>th</sup> August 2018 at 2 different locations. The sound level meters were positioned at 1.5m above ground level (tripod mounted), and 3 metres from any reflective surface. The figure 2.1 includes the measurement locations.

The measurement locations are described below:

Measurement location P1. The sound level meter was located at the boundary of the filling station. The main noise levels affecting this position is road traffic from London Rd.

Measurement location P2. The sound level meter was located in front of a nearby property. The main noise levels affecting this position is road traffic from Arundel Rd.

Noise measurements were made with a calibrated precision grade sound level meters which achieves the requirements of BS EN 61672:2003. The survey was carried out in accordance with the principles of BS 7445:1997 Parts 1-3, 'Description and Measurement of Environmental Noise', British Standard BS4142: 2014: Methods for rating and assessing industrial and commercial sound.

The noise assessment locations were representative of the background noise levels at the nearest noise sensitive receptors which have the potential to be affected by the noise emission from the proposed equipment.

The table below includes the lowest background noise levels measured during the assessment period at the nearest noise sensitive receptors.

Table 2.1: Lowest measured  $L_{A90}$ , dB levels during survey.

| P1                  |                                                      |
|---------------------|------------------------------------------------------|
| Day 14:45 / 23:00   | $L_{A90,1 \text{ hr min (dB)}} = 45$                 |
| Night 23:00 / 06:25 | <b><math>L_{A90,15 \text{ min (dB)}} = 30</math></b> |
| P2                  |                                                      |
| Day 14:30 / 23:00   | $L_{A90,1 \text{ hr min (dB)}} = 46$                 |
| Night 23:00 / 06:18 | $L_{A90,15 \text{ min (dB)}} = 31$                   |

## 2.3 Equipment

- Svantek precision grade sound level meters. Serial numbers: 34927 and 34937.
- Nor-1251 Calibrator. Serial number 32199.
- Environmental wind shield.

The sound level meters were calibrated before and after the survey. No significant drift was noted between the two reference checks.



Figure 2.1: Site map and measurement locations (excerpt from Google Maps).

### 3. ODUs Noise Assessment

#### Outdoor Units (ODUs) Noise Levels

Table 3.1: ODU Noise Levels.

| Unit              | No. of units | SPL (given by manufacturer/supplier) | Measured         | Directivity | SWL    |
|-------------------|--------------|--------------------------------------|------------------|-------------|--------|
| PUHZ125           | 2            | 58 dBA                               | 1.0m of the unit | Q=2         | 66 dBA |
| OP-MPL044VVLP01E  | 3            | -                                    | -                | -           | 76 dBA |
| CM08 Z.C4.MLZ-015 | 3            | 68.5 dBA                             | 1.8m of the unit | Q=2         | 82 dBA |
| MUZ-SF25VE        | 1            | 50.0 dBA                             | 1.0m of the unit | Q=2         | 58 dBA |

In order to assess the total noise to the nearest residential property a distance calculation was undertaken; this is shown below.

Table 3.2: Noise Level calculation at nearest receptors.

| Unit              | No. of units | SWL    | SPL contribution at closest receiver (for Q=8, r=33m) | SPL at closest receiver without acoustic treatment |
|-------------------|--------------|--------|-------------------------------------------------------|----------------------------------------------------|
| PUHZ125           | 2            | 66 dBA | 34 dBA                                                | 56 dBA                                             |
| OP-MPL044VVLP01E  | 3            | 76 dBA | 44 dBA                                                |                                                    |
| CM08 Z.C4.MLZ-015 | 3            | 82 dBA | 50 dBA                                                |                                                    |
| MUZ-SF25VE        | 1            | 58 dBA | 26 dBA                                                |                                                    |

As seen in the above table, resulting sound pressure level is 56 dBA which is 16 dBA above the  $L_{A90,15 \text{ min}}$  (dB) = 30 dBA limit.

## 4. Acoustic treatment – Noise barrier

Data of the units are given as single-number dBA. In order to proceed with the required calculations certain reasonable assumptions should be made in order to come up with a noise spectrum for the units:

Table 4.1: ODU's sound power levels, in dB (assumed).

| Unit              | 63Hz | 125Hz | 250Hz | 500Hz | 1000Hz | 2000Hz | 4000Hz | 8000Hz | Total (dBA) |
|-------------------|------|-------|-------|-------|--------|--------|--------|--------|-------------|
| PUHZ125           | 70   | 69    | 66    | 63    | 62     | 57     | 51     | 43     | 66          |
| OP-MPL044VVLP01E  | 61   | 61    | 67    | 73    | 71     | 70     | 63     | 52     | 76          |
| CM08 Z.C4.MLZ-015 | 67   | 67    | 73    | 78    | 77     | 76     | 73     | 59     | 82          |
| MUZ-SF25VE        | 43   | 43    | 49    | 55    | 53     | 52     | 45     | 34     | 58          |

Based on the above sound power levels, sound pressure levels are calculated at 33m away according to the formula:

$$L_p = L_w - \left| 10 \cdot \log \left( \frac{Q}{4\pi \cdot r^2} \right) \right|$$

Table 4.2: ODU's sound pressure levels, in dB (at r = 33m and assuming a conservative Q = 8 directivity).

| Unit              | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | Total (dBA) |
|-------------------|----|-----|-----|-----|------|------|------|------|-------------|
| PUHZ125           | 38 | 37  | 34  | 31  | 30   | 25   | 19   | 11   | 34          |
| OP-MPL044VVLP01E  | 29 | 29  | 35  | 41  | 39   | 38   | 31   | 20   | 44          |
| CM08 Z.C4.MLZ-015 | 35 | 35  | 41  | 46  | 45   | 44   | 41   | 27   | 50          |
| MUZ-SF25VE        | 11 | 11  | 17  | 23  | 21   | 20   | 13   | 2    | 26          |

Total noise from units 2xPUHZ125, 3xOP-MPL044VVLP01E, 3xCM08 Z.C4.MLZ-015 which are facing the noise sensitive receptors is:

Table 4.3: ODU's sound pressure levels combined, in dB (at r = 33m and assuming a conservative Q = 8 directivity).

| Total SPL from units at 33m (dB) | 63Hz | 125Hz | 250Hz | 500Hz | 1000Hz | 2000Hz | 4000Hz | 8000Hz | Total (dBA) |
|----------------------------------|------|-------|-------|-------|--------|--------|--------|--------|-------------|
|                                  | 44   | 43    | 47    | 52    | 50     | 49     | 46     | 32     | 56          |

In order to mitigate the noise, a solution would be to introduce a 3.0m high barrier (with an areal density not less than 15-20kg/m<sup>2</sup>). The calculation has been conducted assuming that the barrier is installed 1-2m in front of the units and is given below:

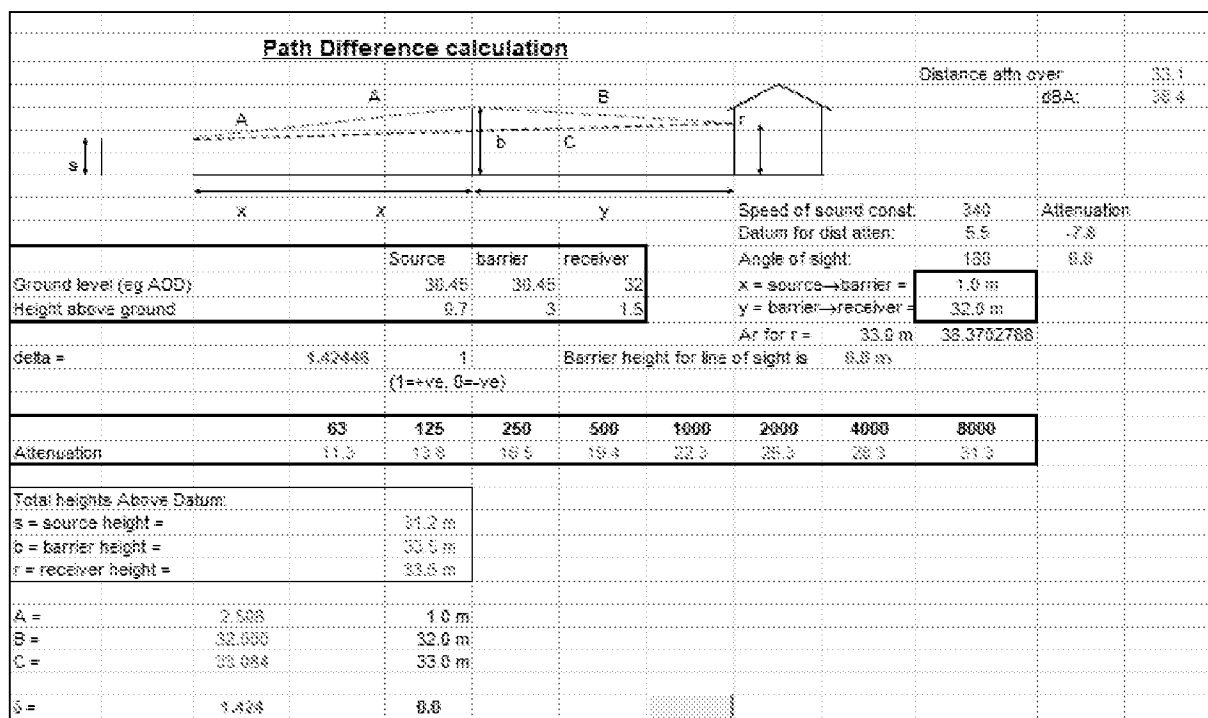


Figure 4.1: Barrier Calculation (excerpt from proprietary Pace Consult barrier calculation sheet)

Deducting the attenuation that the barrier provides we get:

Table 4.4: Calculation of noise levels with noise barrier.

| Calculation                          | 63Hz | 125Hz | 250Hz | 500Hz | 1000Hz | 2000Hz | 4000Hz | 8000Hz | Total (dBA) |
|--------------------------------------|------|-------|-------|-------|--------|--------|--------|--------|-------------|
| (1) Total SPL from units at 33m (dB) | 44   | 43    | 47    | 52    | 50     | 49     | 46     | 32     | 56          |
| (2) Barrier attenuation (dB)         | 11   | 14    | 17    | 19    | 22     | 25     | 28     | 31     | -           |
| (1)-(2) Total SPL with barrier       | 32   | 29    | 30    | 32    | 28     | 24     | 18     | 1      | 33          |

As seen from above, the noise barrier will reduce sound pressure levels of the units down to 33 dBA.

In case the operation of the ODUs - and subsequently the specific noise those introduce - is intermittent, as per BS4142 §9.2, a penalty of 3 dB is to be applied on top of the specific noise which would raise the noise rating around 6 dB above the background noise.

Recommended layout of the noise barrier is given below:

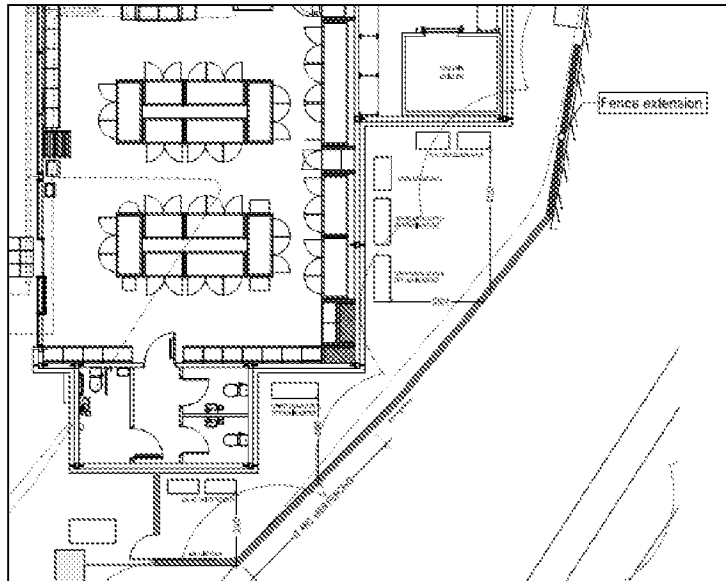


Figure 4.2: Noise barrier location.

## 5. Conclusion

The proposed outdoor units' noise levels have been assessed. Considering no acoustic treatment, the noise levels to the nearest receptor is expected to be more than 20 dBA above the environmental noise limit (measured as  $L_{A90,15 \text{ min}} \text{ (dB)} = 30$ ). Thus, a 3.0m noise barrier (of 15-20kg/m<sup>2</sup> areal density) is proposed to be installed in front of the units. With the introduction of the aforementioned noise barrier resulting noise is calculated to slightly exceed the lowest existing background noise, however, not to a degree that is expected to cause nuisances.

## Appendix 1 – ANC Accreditation



Pace Consult Ltd

has been elected by the Company to  
Full Membership  
of the Association

Date of Election December 2009

Signed



President

(Company limited by guarantee registered in England No. 5289002)

This Certificate remains the property of the Association, returnable on demand

## Appendix 2 – Noise data

OP-MPL044VVLP01E

*Daifeng*

| Application Guidelines       |                |                |                | Product description |                                  |      |       |       |       |                         |                         |                         |            |      |      |      |
|------------------------------|----------------|----------------|----------------|---------------------|----------------------------------|------|-------|-------|-------|-------------------------|-------------------------|-------------------------|------------|------|------|------|
| Model                        | Capacity<br>kW | Capacity<br>HP | Capacity<br>RT | Capacity<br>Tons    | Sound pressure level (SPL) at 1m |      |       |       |       | Sound power level (SWL) | Sound power level (SWL) | Sound power level (SWL) |            |      |      |      |
|                              |                |                |                |                     | Frequency (Hz)                   |      |       |       |       |                         |                         | A-weighted              | C-weighted |      |      |      |
|                              |                |                |                |                     | 250                              | 500  | 1000  | 2000  | 4000  |                         |                         |                         |            |      |      |      |
| Optima™ Plus INVERTER, R404A |                |                |                |                     |                                  |      |       |       |       |                         |                         |                         |            |      |      |      |
| OP-MPL030                    | 114X-130P      | 16.2-20.0      | 30             | 27                  | 3540                             | 1920 | 2340  | 2910  | 3330  | 71.0                    | 80.3                    | 993                     | 962        |      |      |      |
|                              |                |                |                | 32                  | 3450                             | 1800 | 2210  | 2700  | 3030  |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 36                  | -                                | -    | -     | -     | -     |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 43                  | -                                | -    | -     | -     | -     |                         |                         |                         |            |      |      |      |
|                              |                |                | 50             | 27                  | 2880                             | 3340 | 4180  | 4900  | 5360  | 71.9                    | 80.9                    | 980                     | 1400       |      |      |      |
|                              |                |                |                | 32                  | 2510                             | 3130 | 3850  | 4860  | 5380  |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 36                  | 2300                             | 2880 | 3540  | 4090  | 5140  |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 43                  | 2310                             | 2830 | 3270  | 3970  | 4770  |                         |                         |                         |            |      |      |      |
|                              |                |                | 75             | 27                  | 4080                             | 4940 | 6080  | 7120  | 8710  | 72.5                    | 81.5                    | 2147                    | 2328       |      |      |      |
|                              |                |                |                | 32                  | 3710                             | 4680 | 5700  | 6870  | 8180  |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 36                  | 3380                             | 4250 | 5230  | 6310  | 7510  |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 43                  | 3420                             | 3890 | 4810  | 5850  | 6940  |                         |                         |                         |            |      |      |      |
|                              |                |                | 100            | 27                  | 5200                             | 6440 | 7840  | 9400  | 11140 | 73.7                    | 82.7                    | 3064                    | 3348       |      |      |      |
|                              |                |                |                | 32                  | 4840                             | 6020 | 7340  | 8810  | 10440 |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 36                  | 4300                             | 5480 | 6710  | 8080  | 9570  |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 43                  | 4030                             | 5020 | 6160  | 7420  | 8830  |                         |                         |                         |            |      |      |      |
|                              |                |                | OP-MPL040      | 114X-130P           | 16.2-20.0                        | 30   | 27    | 1340  | 2450  | 2980                    | 3650                    | 4410                    | 73.1       | 82.1 | 1147 | 1148 |
|                              |                |                |                |                     |                                  |      | 32    | 1810  | 2260  | 2780                    | 3390                    | 4180                    |            |      |      |      |
|                              |                |                |                |                     |                                  |      | 36    | -     | -     | -                       | -                       | -                       |            |      |      |      |
|                              |                |                |                |                     |                                  |      | 43    | -     | -     | -                       | -                       | -                       |            |      |      |      |
|                              |                |                |                |                     |                                  | 50   | 27    | 1890  | 4190  | 5110                    | 6200                    | 7480                    | 73.8       | 82.8 | 1260 | 1811 |
|                              |                |                |                |                     |                                  |      | 32    | 3140  | 3620  | 4310                    | 5820                    | 6950                    |            |      |      |      |
|                              |                |                |                |                     |                                  |      | 36    | 2670  | 3800  | 4420                    | 5370                    | 6390                    |            |      |      |      |
|                              |                |                |                |                     |                                  |      | 43    | 2640  | 3810  | 4080                    | 4950                    | 5820                    |            |      |      |      |
| 75                           | 27             | 4950           |                |                     |                                  | 6190 | 7550  | 9070  | 10750 | 74.4                    | 83.4                    | 2179                    | 2865       |      |      |      |
|                              | 32             | 4640           |                |                     |                                  | 5790 | 7070  | 8500  | 10080 |                         |                         |                         |            |      |      |      |
|                              | 36             | 4200           |                |                     |                                  | 5270 | 6470  | 7790  | 9280  |                         |                         |                         |            |      |      |      |
|                              | 43             | 3810           |                |                     |                                  | 4820 | 5940  | 7180  | 8550  |                         |                         |                         |            |      |      |      |
| 100                          | 27             | 6430           |                |                     |                                  | 7970 | 9670  | 11510 | 13630 | 75.4                    | 84.4                    | 3267                    | 4148       |      |      |      |
|                              | 32             | 6060           |                |                     |                                  | 7430 | 9030  | 10800 | 12750 |                         |                         |                         |            |      |      |      |
|                              | 36             | 5420           |                |                     |                                  | 6760 | 8230  | 9860  | 11610 |                         |                         |                         |            |      |      |      |
|                              | 43             | 4920           |                |                     |                                  | 6170 | 7540  | 9050  | 10720 |                         |                         |                         |            |      |      |      |
| OP-MPL044                    | 114X-130P      | 16.2-20.0      |                |                     |                                  | 30   | 27    | 2480  | 3040  | 3730                    | 4630                    | 5590                    | 73.1       | 82.1 | 1253 | 1400 |
|                              |                |                |                |                     |                                  |      | 32    | 2340  | 2880  | 3530                    | 4350                    | 5190                    |            |      |      |      |
|                              |                |                |                |                     |                                  |      | 36    | -     | -     | -                       | -                       | -                       |            |      |      |      |
|                              |                |                |                |                     |                                  |      | 43    | -     | -     | -                       | -                       | -                       |            |      |      |      |
|                              |                |                |                |                     |                                  | 50   | 27    | 3270  | 5310  | 6480                    | 7820                    | 9270                    | 73.8       | 82.8 | 2178 | 2867 |
|                              |                |                |                |                     |                                  |      | 32    | 2980  | 4670  | 5470                    | 7120                    | 8730                    |            |      |      |      |
|                              |                |                |                |                     |                                  |      | 36    | 2640  | 4500  | 5570                    | 6720                    | 8010                    |            |      |      |      |
|                              |                |                |                |                     |                                  |      | 43    | 3340  | 4360  | 5140                    | 6210                    | 7410                    |            |      |      |      |
|                              |                |                | 75             | 27                  | 6280                             | 7790 | 9460  | 11320 | 13380 | 74.5                    | 83.5                    | 3263                    | 3635       |      |      |      |
|                              |                |                |                | 32                  | 5840                             | 7260 | 8840  | 10590 | 12510 |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 36                  | 5220                             | 6590 | 8060  | 9680  | 11450 |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 43                  | 4750                             | 6010 | 7360  | 8980  | 10540 |                         |                         |                         |            |      |      |      |
|                              |                |                | 100            | 27                  | 8870                             | 9610 | 11920 | 14260 | 16720 | 75.5                    | 84.5                    | 4771                    | 5297       |      |      |      |
|                              |                |                |                | 32                  | 7480                             | 9240 | 11700 | 13290 | 15800 |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 36                  | 6740                             | 8370 | 10100 | 12090 | 14310 |                         |                         |                         |            |      |      |      |
|                              |                |                |                | 43                  | 6080                             | 7610 | 9280  | 11080 | 13010 |                         |                         |                         |            |      |      |      |

Electrical mode P: Compressor 480V/3/50 Hz, fan 120V/1/50 Hz

## MUZSF25VE

From: Geoffrey Thomas [REDACTED]  
 Sent: 21 August 2018 10:09  
 To: Rodney Whitwell [REDACTED]  
 Cc: Scott Atkinson [REDACTED]  
 Subject: Fwd: Fontwell s/STN EXTERNAL PLANT

Hi Rodney,

Our A/C units to be installed are as followed:  
 2 x PUHZ125 (3PH) – 70Dba for each unit.  
 1 x MUHZ25 (1PH) – 50Dba for each unit.

Should it be necessary to move these 3 condensing units or refrigeration units to the end of the building. Will not affect the pipe sizes or operation or costs of the systems.

Should you have any questions, please do not hesitate to contact me.

Regards

Geoffrey Thomas  
 [REDACTED]

From: Geoffrey Thomas [REDACTED]  
 Sent: 23 August 2018 16:23  
 To: David Herriman (Allan B Matthews)  
 Cc: Scott Atkinson  
 Subject: RE: Fontwell a/c condensers

Hi David,

Apologies, the correct unit is MUZSF25VE.

The data is SPL, I hope this helps

The dba is measured at 1m from the front of the unit and 1m off the floor (height)

Many thanks.

regards  
 Geoff Thomas

## CM08 Z.C4.MLZ-015

CM08 Z.C4.MLZ-015.DS5

| COMPRESSOR                           |               |
|--------------------------------------|---------------|
| Brand                                | Danfoss       |
| Model                                | MLZ 015 T4UP8 |
| Cooling Capacity                     | 13.543 Watts  |
| Evap./Cond. Temp.                    | -10/+45°C     |
| Refrigerant                          | R 404A        |
| Compressor HP                        | 1.2           |
| Power Supply                         | 220 V/50 Hz   |
| Noise Level (at 1.0 m)               | 58.23 dBA     |
| Noise Level (at 10.0 m)              | 35.23 dBA     |
| Compressor Discharge line (Ø inches) | 1/2"          |
| Compressor Suction line (Ø inches)   | 3/4"          |

| EQUIPMENT             |            |                             |
|-----------------------|------------|-----------------------------|
|                       | Brand      | Model                       |
| Receiver              | FrigoCraft | FrigoCraft 40L              |
| Filter Drier          | SAFENUA    | Safenua D145-S0086-1635     |
| Sight Glass           | SAFENUA    | Safenua SY-42022            |
| Low Pressure Control  | Danfoss    | Danfoss 061F9652 ACB-2UC32W |
| High Pressure Control | Danfoss    | Danfoss 061F9077 ACB-2UC32W |
| Oil Separator         | -          | -                           |

| DIMENSIONS                                | X       | Y      | Z      |  |
|-------------------------------------------|---------|--------|--------|--|
| Device mm (L/W/H)                         | 1095 mm | 675 mm | 512 mm |  |
| Packing mm (L/W/H) (Include Oil Receiver) | 1010 mm | 700 mm | 540 mm |  |
| WEIGHT                                    | Kg      |        |        |  |
| Device                                    | 75      |        |        |  |
| Packing                                   | 78      |        |        |  |
| CONNECTION                                | inches  |        |        |  |
| Liquid line (Ø inches)                    | 3/8"    |        |        |  |
| Suction line (Ø inches)                   | 3/8"    |        |        |  |

| CAPACITY |       |       | COP   |      |      |
|----------|-------|-------|-------|------|------|
| Q        | 5     | -10   | -15   | -5   | -10  |
| 40       | 4.813 | 3.646 | 3.179 | 2.84 | 2.40 |
| 45       | 4.254 | 3.343 | 2.925 | 2.34 | 1.98 |
| 50       | 3.886 | 3.231 | 2.603 | 1.93 | 1.64 |

| CONDENSER AND FAN  | Description                    |
|--------------------|--------------------------------|
| Brand              | ZARVER                         |
| Model              | 10 15 - 15 m³                  |
| Geometry           | 25.00 x 21.65 mm               |
| Copper Pipe Size   | 2mm x 0.30 mm-Internal Grooved |
| Fin Spacing        | 2.1 mm                         |
| Fin Type           | Corrugated                     |
| Heat Transfer Area | 15.33 m²                       |
| Fan Brand          | C-FAN                          |
| Fan Model          | 1 x Ø400                       |
| Inlet Power (kW)   | 0.147                          |
| IP Code            | IP 54                          |

