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# BRAZENNOSE HOUSE, MANCHESTER

# ASSESSMENT TO DISCHARGE PLANNING CONDITION 21

RAMBOLL

# BRAZENNOSE HOUSE, MANCHESTER
# ASSESSMENT TO DISCHARGE PLANNING CONDITION 21

| | |
|---|---|
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| Approved by | **Craig Barson** |
| Description | **Noise assessment which demonstrates that proposed plant serving the new Brazennose House building meets the requirement of Condition 21 of the decision notice for these items (application ref: 111805/FO/2016)** |

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# CONTENTS


| | | |
|---|---|---|
| **1.** | **Summary** | **2** |
| **2.** | **Criteria** | **3** |
| 2.1 | BS4142 | 3 |
| 2.2 | Nearest sensitive receptor | 3 |
| **3.** | **Plant items serving Brazennose House** | **5** |
| **4.** | **Baseline noise survey** | **8** |
| 4.1 | Noise climate | 8 |
| 4.2 | Weather | 8 |
| 4.3 | Measurement locations | 8 |
| 4.4 | Equipment | 9 |
| 4.5 | Results of manned measurements | 9 |
| 4.6 | Results of unmanned noise logging | 10 |
| **5.** | **Assessment** | **11** |
| 5.1 | Noise limits at the nearest noise sensitive receptors | 11 |
| 5.2 | Noise predictions | 11 |
| 5.3 | Statement of uncertainty | 14 |
| **6.** | **Conclusion** | **15** |

Appendix 1 – Roof top plant drawings

# 1. SUMMARY

On behalf of Marshall Construction (West Yorkshire) Ltd, Ramboll were instructed to assess noise levels from new plant items serving the proposed office development of Brazennose House.

The purpose of this assessment is to demonstrate that noise emissions meet acceptable limits at the nearest noise sensitive receptor, as required by Manchester City Council (MCC) under application ref: 111805/FO/2016.

Condition 21 of the decision notice states:

> *'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location.*
>
> *The scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site.*
>
> *Reason -To safeguard the amenities of the occupiers of nearby residential accommodation, to minimise the impact of the development and to prevent a general increase in pre-existing background noise levels around the site pursuant to policies SP1 and DM1 of the Core Strategy and saved UDP policies DC26.'*

This report identifies the proposed external plant items serving the new building and predicts the expected levels at the nearest sensitive receptor, which is understood to be The Hidden Gem church and living quarters on Mulberry Street.

This assessment demonstrates that noise levels from the proposed new items of plant are expected to be lower than daytime and night-time background levels, and comply with the requirements of planning condition 21.

# 2. CRITERIA

Condition 21 of the decision notice is the typical requirement of MCC for external plant items serving developments within the City and is also set out in MCC's document '*Planning and Noise – Technical Guidance' (2015).*

The MCC document identifies that plant items must be assessed in accordance with the methodology in BS4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound'* (BS4142), where the term 'Rating Level' is defined.

## 2.1 BS4142

BS4142 provides a methodology for assessing levels from new noise sources against the existing noise climate. The standard defines the new noise source (e.g. plant, or commercial operation etc) as the 'specific' noise level.

Since certain acoustic features (tonality, impulsivity, intermittency etc.) can increase the significance of a new noise source when compared to existing background noise levels, BS4142 identifies that suitable acoustic penalties should be applied to the specific noise level where this is the case. This results in a **'Rating Level'** of the noise source(s) under consideration.

Comparison of the Rating Level to the background noise level determines the significance of the new noise source at the receptor(s) under assessment. If the Rating Level is higher than the background noise level, BS4142 identifies there may be an impact:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the Rating Level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact. 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.

As stated in the decision notice, MCC require the Rating Level to be 5dB lower than background noise levels.

## 2.2 Nearest sensitive receptor

Based on Ramboll's observations of the area surrounding the new Brazennose House building, we understand the nearest noise sensitive receptor to the development is The Hidden Gem on Mulberry Street and its associated living quarters, which are adjacent to the church. Figure 1 shows the site boundary and The Hidden Gem in context (yellow).

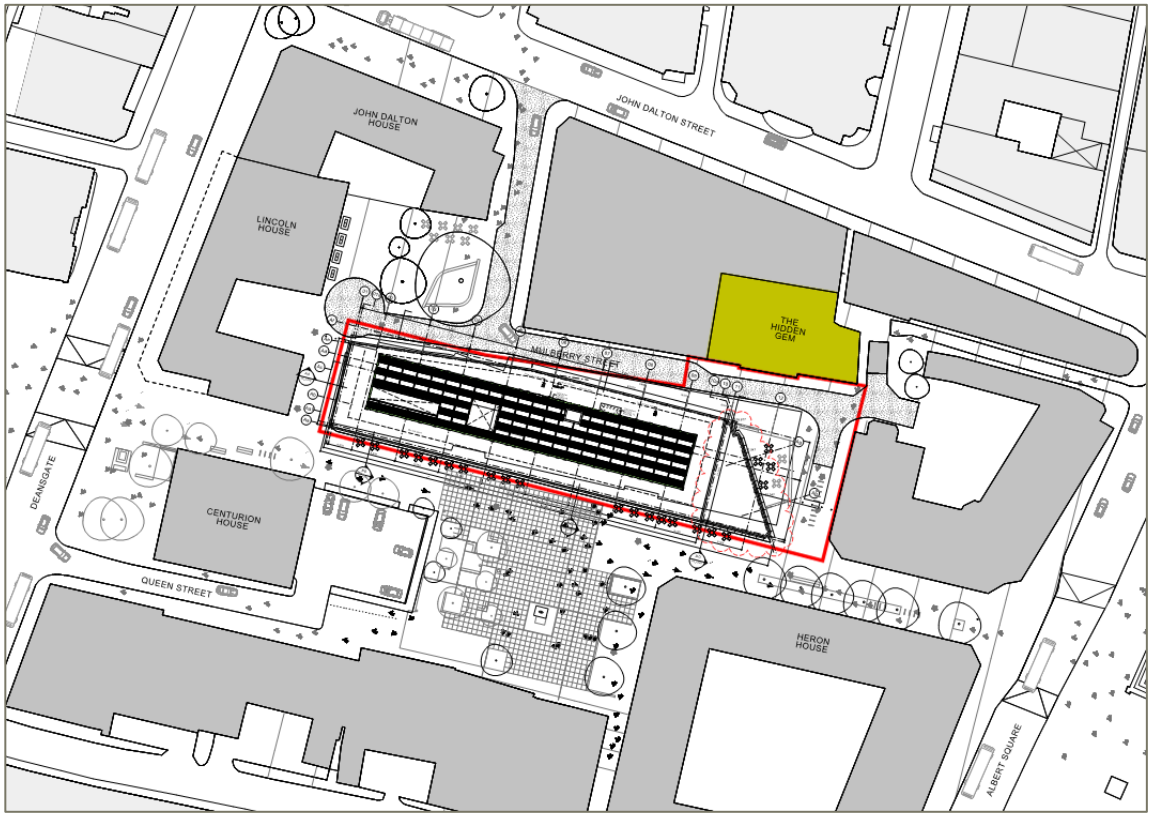
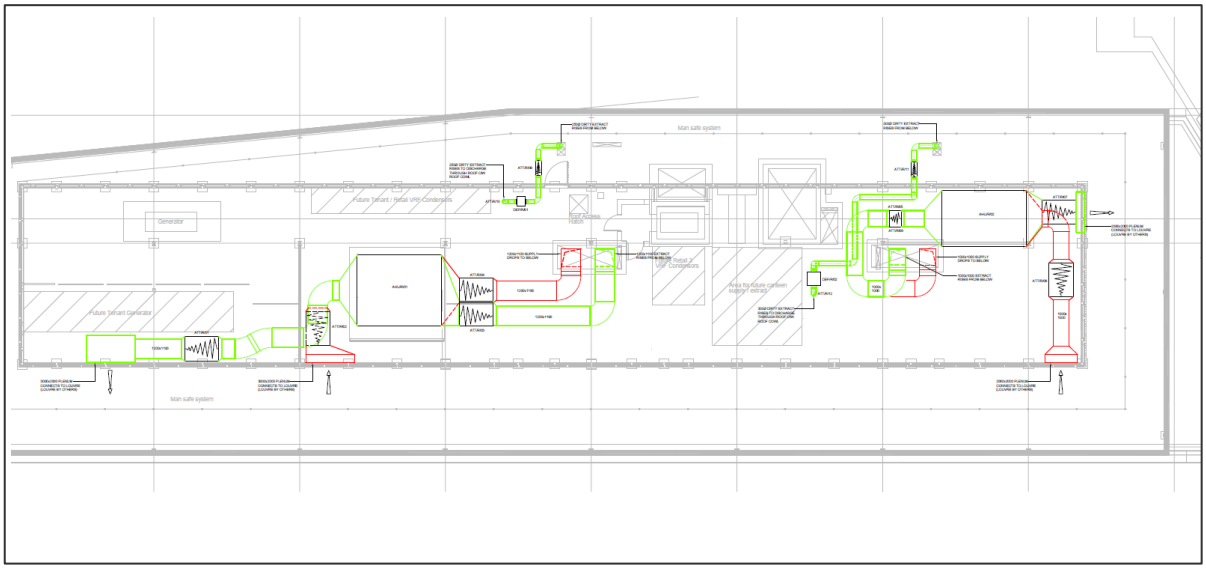



**Figure 1 – Site boundary showing location of The Hidden Gen (NSR)**

# 3. PLANT ITEMS SERVING BRAZENNOSE HOUSE

Figure 2a and 2b show the proposed roof top plant at Brazennose House, as per drawings *C5784-M-57-R-01 Rev 2* and *C5784-M-53-R-01 Rev 1,* which are presented full in Appendix 1.

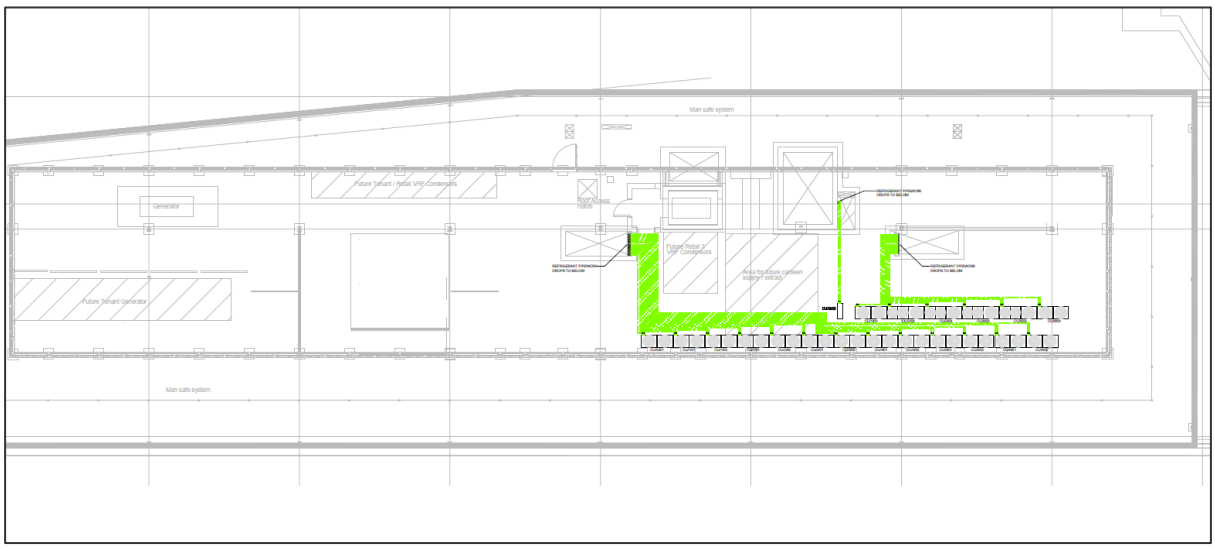


| ROOF AIR HANDLING UNIT SCHEDULE | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REFERENCE: | LOCATION: | MODEL: | DUTY (m3/s): | | RESISTANCE (pa): | DIMENSIONS (mm): | | | WEIGHT (kg): | ELECTRICAL: | | | |
| | | | SUPPLY | EXTRACT | | H | W | L | | SUPPLY: | PHASE: | EXTRACT MP: | SUPPLY MP: |
| AHU/R/01 | ROOF | TEMPAIR 97T | 9.4 | 9.4 | 400 | 2750 | 4360 | 5200 | 6505 | 415v, 50Hz | 3 | 3 x 6 kW | 3 x 6 kW |
| AHU/R/02 | ROOF | TEMPAIR 84T | 6.13 | 6.13 | 400 | 2750 | 3460 | 5200 | 4980 | 415v, 50Hz | 3 | 2 x 6 kW | 2 x 6 kW |
| AS MANUFACTURED BY AIRSOURCE VENTILATION LTD | | | | | | | | | | | | | |

| ROOF DIRTY EXTRACT FAN SCHEDULE | | | | | | | |
|---|---|---|---|---|---|---|---|
| REF: | MANUFACTURER: | MODEL: | DIMENSIONS (mm): (LxWxD) | NOISE (dba): | DUTY (m3/s): | ELECTRICAL DETAILS | |
| | | | | | | PHASE: | FLC (Amps): |
| DEF/R/01 | AIR VENT TECH | EMT250/EC | 550x600x450 | 35 | 0.24 @ 200Pa | SINGLE | 1.4 |
| DEF/R/02 | AIR VENT TECH | EMT310/EC | 800x850x450 | 48 | 0.323 @ 200Pa | SINGLE | 3.1 |

| ROOF ATTENUATOR SCHEDULE | | | |
|---|---|---|---|
| REFERENCE: | MODEL: | SIZE (mm) LxWxH | AIR VOLUME (m3/s): |
| ATT/R/01 | SG02V/3C/L/S | 1800x1400x1400 | 9.40 |
| ATT/R/02 | SG02H/3C/L/S | 1800x1500x1350 | 9.40 |
| ATT/R/03 | SG01V/3C/L/S | 1200x1500x1300 | 9.40 |
| ATT/R/04 | SG02H/3C/L/S | 1800x1475x1325 | 9.40 |
| ATT/R/05 | SG01V/3C/L/S | 750x1000x1000 | 6.13 |
| ATT/R/06 | SG01V/3C/L/S | 600x1000x1000 | 6.13 |
| ATT/R/07 | SG02V/3C/L/S | 2100x1400x1250 | 6.13 |
| ATT/R/08 | SG02H/3C/L/S | 1500x1300x1000 | 6.13 |
| ATT/R/09 | PG01U/1K/L/ | 320x355Ø | 0.24 |
| ATT/R/10 | PG01U/1K/L/ | 320x355Ø | 0.24 |
| ATT/R/11 | PG01U/1K/L/ | 320x405Ø | 0.323 |
| ATT/R/12 | PG01U/1K/L/ | 320x405Ø | 0.323 |
| ATTENUATORS ARE AS MANUFACTURED BY CAICE | | | |

**Figure 2a – Roof mounted plant, including AHUs and extract fans**



CONDENSER SCHEDULE

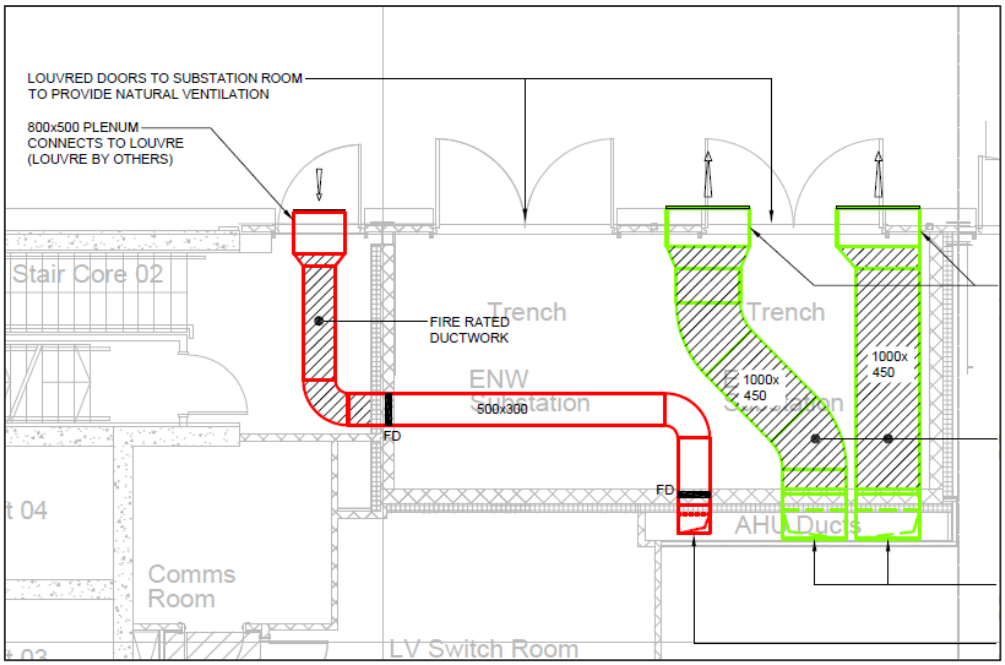
| REFERENCE: | MODEL: | CONDENSER UNIT SERVES: | DIMENSIONS WxDxH (mm): | WEIGHT (kg): | CAPACITY | | NOISE (DBA): | RUNNING CURRENT (A) | | STARTING CURRENT (A): | POWER SUPPLY: | FUSE RATING (HRC A): |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | HTG (kW): | CLG (kW): | | HTG: | CLG: | | | |
| CU/G/01 | PURY-EP400YSNW-A | AC/G/01, AC/G/02 & AC/1/34 | 1870x740x1858 | 468 | 50.0 | 45.0 | 62 | 16.1 | 16.1 | 8/8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/G/02 | PUHZ-ZRP71VHA2 | AC/G/03 | 950x330x943 | 70 | 8.0 | 7.1 | 67 | 8.75 | 7.79 | 6 | 240v, 50Hz - 1 PHASE | 25 |
| CU/1/01 | PURY-EP400YSNW-A | AC/1/01 - 08 & AC/1/16 - 17 | 1870x740x1858 | 468 | 50.0 | 45.0 | 62 | 16.1 | 16.1 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/1/02 | PURY-EP400YSNW-A | AC/1/09 - 15 & AC/1/18 - 20 | 1870x740x1858 | 468 | 50.0 | 45.0 | 62 | 16.1 | 16.1 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/1/03 | PURY-EP500YSNW-A | AC/1/21 - AC/1/33 | 1870x740x1858 | 468 | 63.0 | 56.0 | 64 | 17.0 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/2/01 | PURY-EP450YSNW-A | AC/2/01 - 08 & AC/2/17 - 19 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/2/02 | PURY-EP450YSNW-A | AC/2/09 - 16 & AC/2/20 - 22 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/2/03 | PURY-EP650YSNW-A | AC/2/23 - AC/2/38 | 2190x740x1858 | 515 | 81.5 | 73.0 | 69 | 20.3 | 24.4 | 8 | 415v, 50Hz - 3 PHASE | 2 x 25 |
| CU/3/01 | PURY-EP450YSNW-A | AC/3/01 - 08 & AC/3/17 - 19 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/3/02 | PURY-EP450YSNW-A | AC/3/09 - 16 & AC/3/20 - 22 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/3/03 | PURY-EP650YSNW-A | AC/3/23 - AC/3/38 | 2190x740x1858 | 515 | 81.5 | 73.0 | 69 | 20.3 | 24.4 | 8 | 415v, 50Hz - 3 PHASE | 2 x 25 |
| CU/4/01 | PURY-EP450YSNW-A | AC/4/01 - 08 & AC/4/17 - 19 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/4/02 | PURY-EP450YSNW-A | AC/4/09 - 16 & AC/4/20 - 22 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/4/03 | PURY-EP650YSNW-A | AC/4/23 - AC/4/38 | 2190x740x1858 | 515 | 81.5 | 73.0 | 69 | 20.3 | 24.4 | 8 | 415v, 50Hz - 3 PHASE | 2 x 25 |
| CU/5/01 | PURY-EP450YSNW-A | AC/5/01 - 08 & AC/5/17 - 19 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/5/02 | PURY-EP450YSNW-A | AC/5/09 - 16 & AC/5/20 - 22 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/5/03 | PURY-EP650YSNW-A | AC/5/23 - AC/5/38 | 2190x740x1858 | 515 | 81.5 | 73.0 | 69 | 20.3 | 24.4 | 8 | 415v, 50Hz - 3 PHASE | 2 x 25 |
| CU/6/01 | PURY-EP450YSNW-A | AC/6/01 - 08 & AC/6/17 - 19 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/6/02 | PURY-EP450YSNW-A | AC/6/09 - 16 & AC/6/20 - 22 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/6/03 | PURY-EP500YSNW-A | AC/6/23 - AC/6/33 | 1870x740x1858 | 468 | 63.0 | 56.0 | 64 | 17.0 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |

ALL EXTERNAL CONDENSER UNITS ARE AS MANUFACTURED BY MITSUBISHI

**Figure 2b – Roof mounted plant, condensers**

Noise data for the above items has been sourced from the manufacturer of each item and atmospheric attenuators for AHUs and extracts provided by Caice, determined specifically for this project.

In addition to the plant items located at roof level, the scheme includes basement smoke extract plant which will extract to Mulberry Street to the north. The location of the atmospheric openings to Mulberry Street are presented below.




| BASEMENT CARPARK EXTRACT FAN SCHEDULE | | | | | | | |
|---|---|---|---|---|---|---|---|
| REF: | MANUFACTURER: | MODEL: | DIMENSIONS (mm): (LxWxD) | NOISE (dba): | DUTY (m3/s): | ELECTRICAL DETAILS | |
| | | | | | | PHASE: | MOTOR POWER: |
| EF/B/01 | PVE | VFD | TBCx630 | 54 | 4.13 @ 350Pa | THREE | 4.6kW |
| EF/B/02 | PVE | VFD | TBCx630 | 54 | 4.13 @ 350Pa | THREE | 4.6kW |

| BASEMENT CARPARK INDUCTION FAN SCHEDULE | | | | | | | |
|---|---|---|---|---|---|---|---|
| REF: | MANUFACTURER: | MODEL: | DIMENSIONS (mm): (LxWxD) | NOISE (dba): | DUTY (m3/s): | ELECTRICAL DETAILS | |
| | | | | | | PHASE: | MOTOR POWER: |
| IF/B/01 | PVE | IVF-HC-50 | 1322x834x245 | 69 | 0.94 - 1.9 | THREE | 1.3kW |

**Figure 3 – Location of new atmospheric openings for basement smoke extract**

# 4. BASELINE NOISE SURVEY

As part of Ramboll's wider involvement with the project, existing noise levels were measured in 2015. The details and data of the survey are summarised below.

## 4.1 Noise climate

In 2015, the noise climate around the site was dominated by road traffic noise from Deansgate and vehicles through Albert Square. Plant noise from adjacent buildings was also a dominant noise source on Mulberry Street.

Other sources of noise noted during the manned measurement period were pedestrians on Mulberry Street, clock chimes from the Town Hall, and sporadic building works on the building immediately North of Brazennose House. Care was taken to exclude noise from such sources in the measurements.

## 4.2 Weather

Weather conditions throughout the manned survey period were noted as dry and overcast with an occasional light breeze.

## 4.3 Measurement locations

A series of 15-minute manned measurements was taken at four locations near Brazennose House between the hours of 16:00 and 19:30 on Tuesday 13th October 2015. All measurements were taken by Rachel Bennett MIOA of Ramboll Acoustics.

Unmanned measurements were taken every 15 minutes at roof level on Brazennose House between 13:30 on Friday 27th November and 12:15 on Thursday 3rd December 2015.

The sound level meter calibration was checked immediately before and after the measurement periods. No fluctuation in calibration was detected.

The approximate measurement locations are shown in Figure 4.

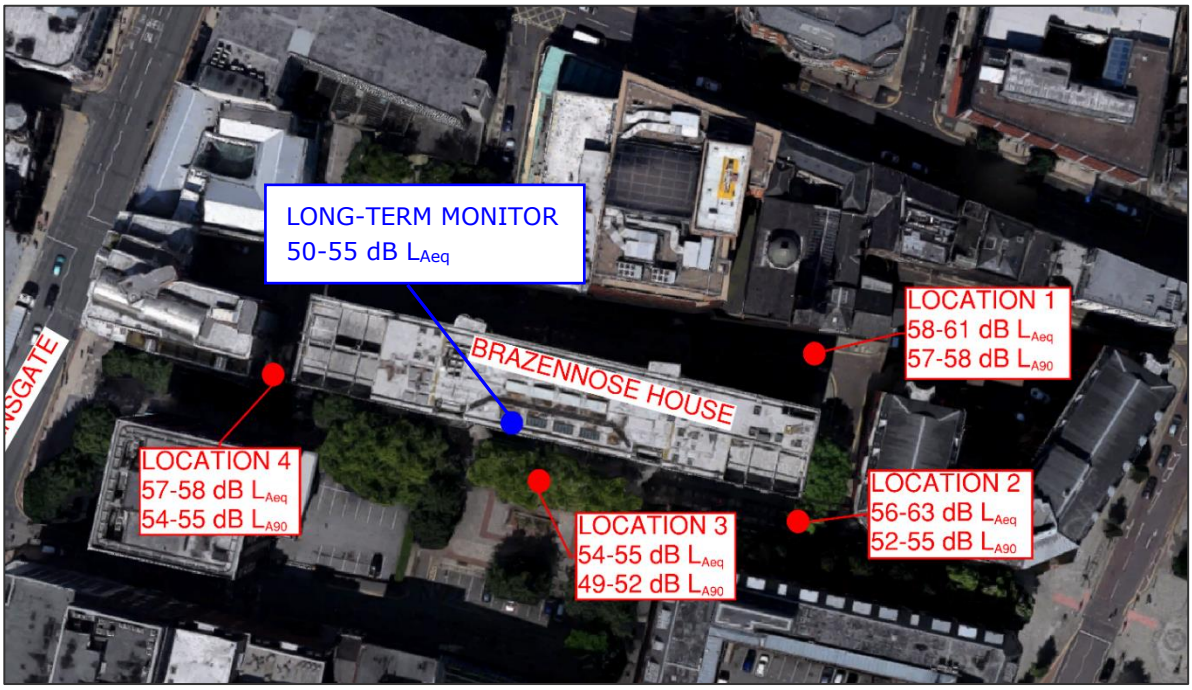



**Figure 4 – Outline boundary of GEIC showing 2015 noise survey measurement locations**

**Location 1:** On the footpath outside the entrance to St Mary's the Hidden Gem

**Location 2:** At the South East corner of Brazennose House

**Location 3:** Outside the entrance to Brazennose House in Lincoln Square

**Location 4:** At the Western corner of Brazennose House on Mulberry Street

The noise logger was situated on the only accessible area available at roof level on Brazennose House, overlooking Brazennose Street.

### 4.4 Equipment

The following measurement equipment was used to conduct the survey:

• Norsonics Nor118 Class 1 Sound Level Analyser

• GRAS 40AEF ½" microphone

All measurement equipment owned or hired and operated by Ramboll Acoustics has annual calibration checks carried out by external companies traceable to national standards. Copies of all calibration records are kept and can be provided upon request.

### 4.5 Results of manned measurements

A summary of the results of manned measurements at each location is shown in Figure 4 above (Red text). Typical background levels ranged between 50 and 55dB $L_{A90}$ during the daytime at the manned measurement locations.

### 4.6 Results of unmanned noise logging

The unmanned measurements consider background levels over a longer period. Based on the data measured using this sound level meter, typical background noise levels ranged between 47 – 57dB $L_{A90}$.

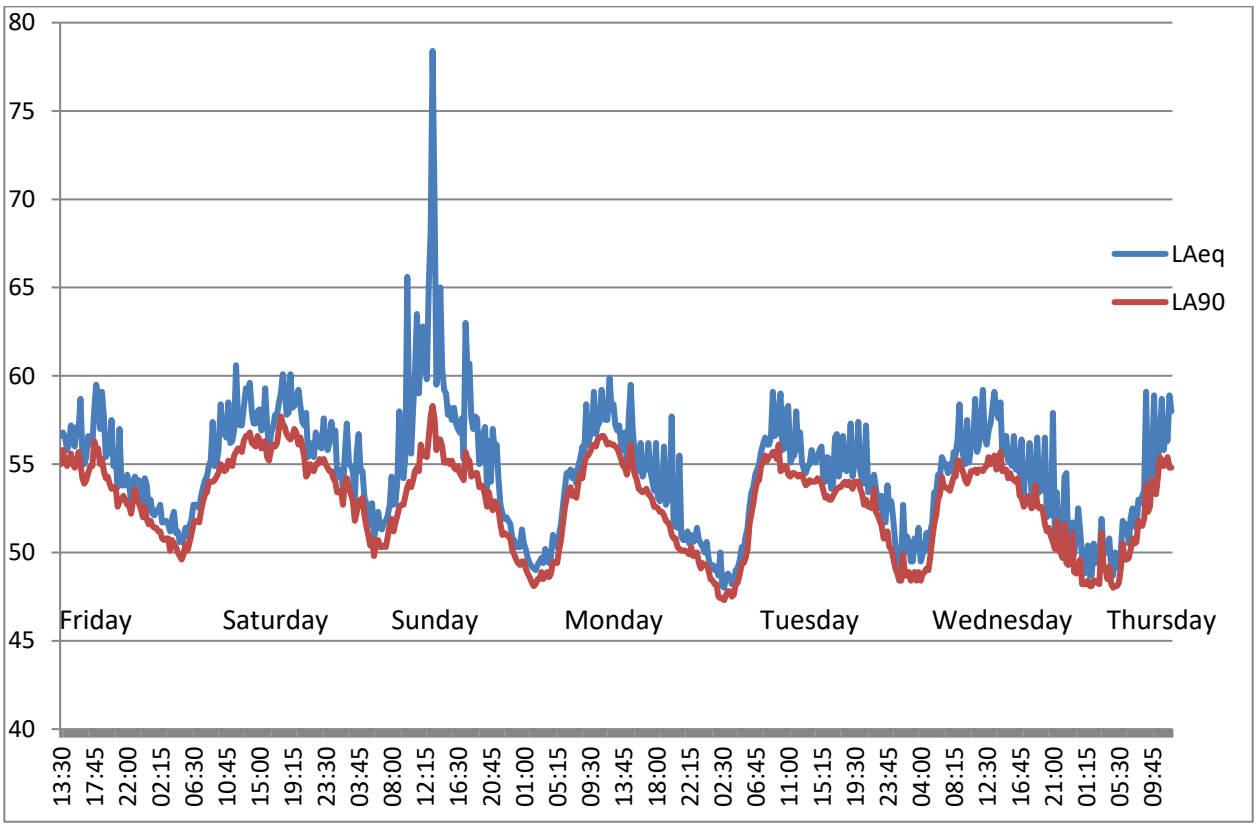



**Figure 5: Unmanned measurement results**

# 5. ASSESSMENT

## 5.1 Noise limits at the nearest noise sensitive receptors

Based on the noise survey data measured by Ramboll, the following typical background noise levels have been used to set plant noise limits at The Hidden Gem. The daytime noise limit is based on a conservative background level between the ranges of 49-55dB $L_{A90}$ at measurement locations 2 and 3, rather than position 1, where background levels were 5dB higher. The night-time background level represents the typical lowest background level during the 8-hour night-time periods measured.

| | Typical background noise level ($L_{A90}$ dB) |
|---|---|
| Daytime (0700h to 2300h) | 52 |
| Night-time (2300h to 0700h) | 47 |

**Table 1 – Typical daytime and night-time background levels**

To meet the requirement of Condition 21, the rating level ($L_{Ar,Tr}$) of plant items associated with the new Brazennose House Building must controlled to 5dB below existing background noise levels. Therefore, the following noise limits are proposed.

| Proposed plant noise limit at nearest receptor, dB $L_{Ar,Tr}$ | |
|---|---|
| Daytime | Night |
| 47 | 42 |

**Table 2 – Noise limits at The Hidden Gem**

## 5.2 Noise predictions

To accurately predict noise levels of plant serving the new building, Ramboll has used CadnaA noise modelling software.

The following details apply to the model.

- The casing breakout for the AHUs are represented in the model by cuboids equal to the dimensions shown on the manufacturer's datasheets. A sound power level has been applied to the surface areas of these cuboids to correspond with the casing radiated sound power level provided by the manufacturer. We have assumed the unit radiates sound equally from all surfaces.
- The model ignores plant screens, and parapets. This assumes worst case propagation and noise levels could be lower where such features apply to the final building
- All ground areas are modelled as hard reflective surfaces.
- The heights of nearby buildings are based on architect's drawings, or approximations from Google Street View.
- The order of reflections in the model is set to 3.

- The model considers a receptor point of 9m above ground to represent first and second floor windows of the living quarters.

Figures 6a and 6b below illustrates the resultant noise levels at the nearest sensitive receptor of The Hidden Gem on Mulberry Street.

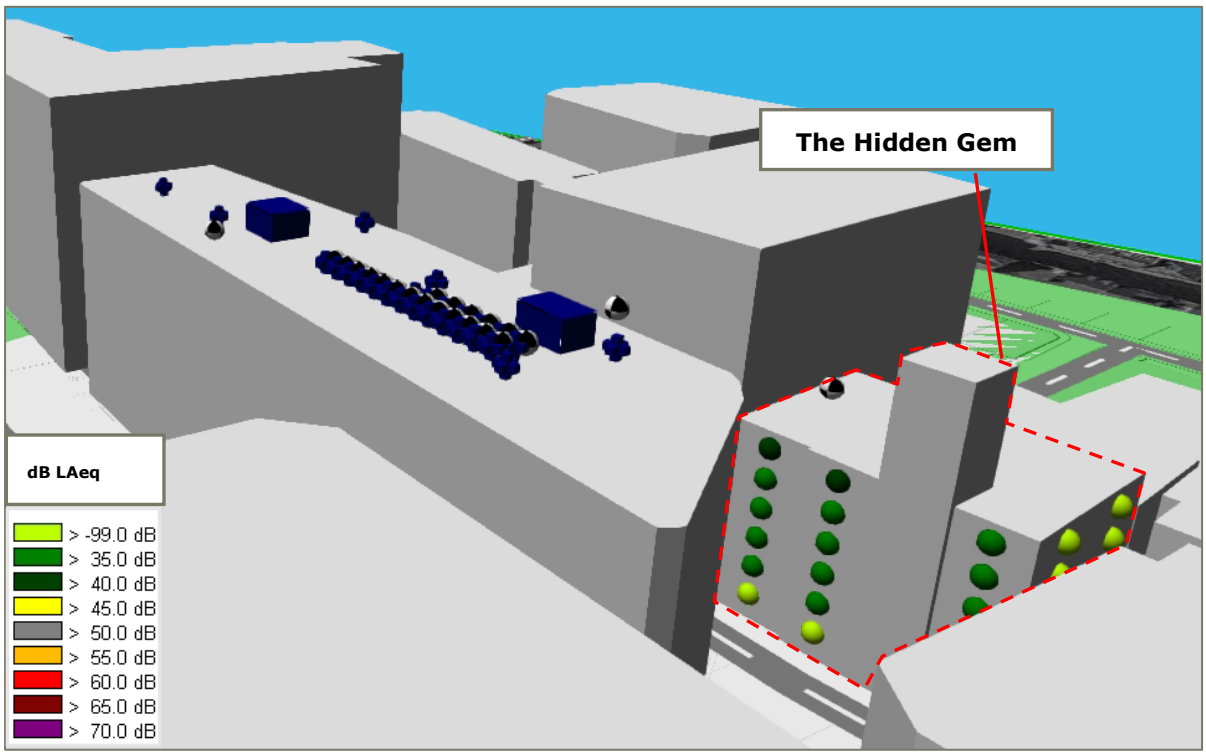



**Figure 6a – CadnaA model 3D view showing roof top plant and predicted noise levels at The Hidden Gem**




**Figure 6b – CadnaA model plan view showing roof top plant and predicted noise levels at The Hidden Gem (2nd floor)**

The noise levels presented in Figures 5a and 5b show that predicted noise levels at the second floor The Hidden Gem and its living quarters are up to 37dB $L_{Aeq}$, which is lower than the noise limits set out in Table 2. These levels exclude noise levels from the car park extract system, which on 15% duty for most times of the year could be 25dB $L_{Aeq}$ at The Hidden Gem, rising to 40dB $L_{Aeq}$ where additional demand to clear $CO_2$ levels is required at 30% duty. As a result, at 30% duty overall daytime noise levels could be up to 42dB $L_{Aeq}$.

The majority of plant, such as condensers and car park extract fans, are broadband and expected to run continuously during office occupation. AHUs typically have higher noise levels at 125 to 250Hz as is the case here. However, as shown in Table 3 the predicted spectral shape at the second floor of The Hidden Gem does not indicate the resulting noise levels will be tonal. Therefore, no correction has been applied to arrive at the rating level.

| **dB Leq @ octave band centre frequency, Hz** | | | | | | |
|---|---|---|---|---|---|---|
| **63** | **125** | **250** | **500** | **1k** | **2k** | **4k** |
| 53 | 42 | 42 | 34 | 28 | 24 | 18 |

**Table 3 – Spectral output from CadnaA at second floor of The Hidden Gem**

It is important to note that the model currently represents all plant items working 100% of the time (with the exception of the car park plant), and except for the hottest periods, demand on condensers is expected to be on 50% at full duty. The remaining condensers would be on low demand. Therefore, noise levels would be lower than predicted for most daytime scenarios.

At night, the demand on plant will be significantly reduced due to the limited. Plant items are expected to be running on a 'tick over' or night set back mode only and the car park extract system would be at 15% duty. Therefore, overall noise levels at The Hidden Gem and its associated living quarters would be less than 40dB $L_{Aeq}$ and meet the night-time limit for plant.

### 5.3 Statement of uncertainty

The noise assessment above and model produced by Ramboll are based on the data available from the MEP subcontractor and manufacturers of each plant item, or associated attenuator. We assume the information provided, including duty rates for AHUs is correct. While the model provides a means of determining noise levels from the plant are suitable at the nearest sensitive receptor, it is right t acknowledge uncertainty in such assessments:

The model built by Ramboll is based on simplified geometry and placement of plant items, typically as point sources. It may be that additional building features of Brazennose House such as parapets, or screening from other plant items helps to reduce noise levels further. Similarly, there may be on rare occasion be reflective surfaces near to the nearest sensitive receptor that marginally increase noise levels beyond those within the model.

It should also be noted that the model excludes any metrological conditions such as unfavourable wind direction, or wet surfaces, which may again marginally increase local noise levels as a result of plant serving Brazennose House.

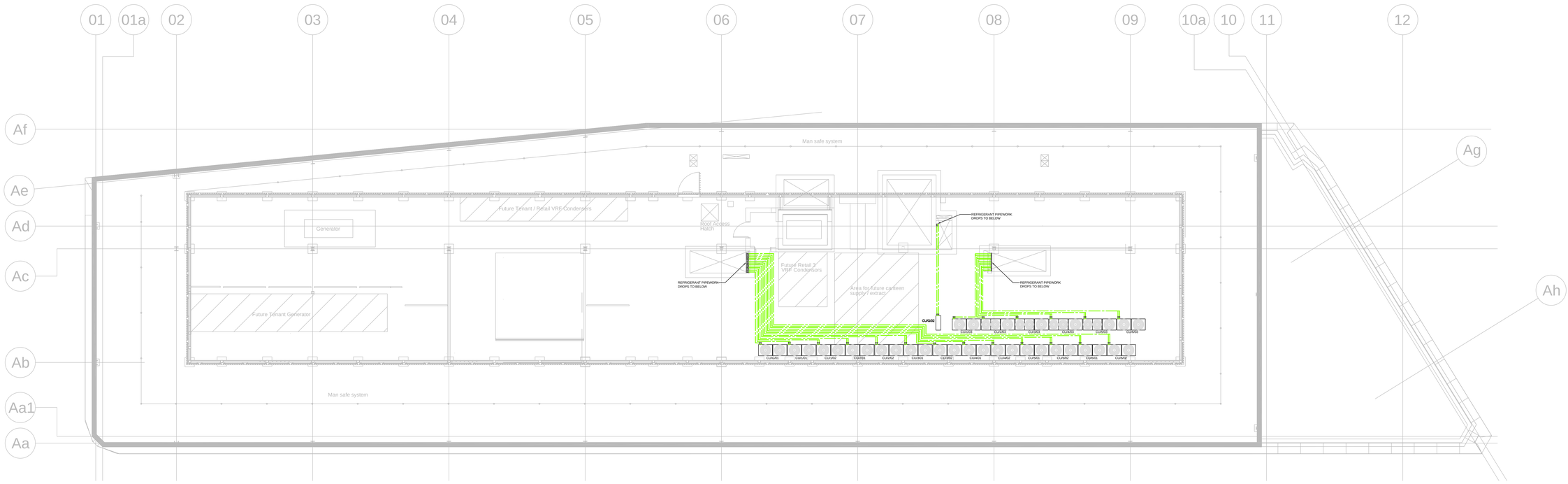
The noise survey done by Ramboll in 2016 has been deemed representative of current background noise levels in the vicinity of The Hidden Gem. Since at the time of writing much of the City is

vacated due to the COVID-19 pandemic, additional spot-check measurements are expected to be unrepresentative. This assessment assumes background levels post-COVID-19 will return to similar levels to those measured in 2016.

# 6. CONCLUSION

Based on the above assessment and predicted noise levels, the requirement of Condition 21 is satisfied by the plant items proposed at the new Brazennose House building.

# APPENDIX 1 – ROOF TOP PLANT DRAWINGS




## CONDENSER SCHEDULE

| REFERENCE: | MODEL: | CONDENSER UNIT SERVES: | DIMENSIONS WxDxH (mm): | WEIGHT (kg): | CAPACITY HTG (kW): | CAPACITY CLG (kW): | NOISE (DBA): | RUNNING CURRENT (A) HTG: | RUNNING CURRENT (A) CLG: | STARTING CURRENT (A): | POWER SUPPLY: | FUSE RATING (HRC A): |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CU/G/01 | PURY-EP400YSNW-A | AC/G/01, AC/G/02 & AC/1/34 | 1870x740x1858 | 468 | 50.0 | 45.0 | 62 | 16.1 | 16.1 | 8/8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/G/02 | PUHZ-ZRP71VHA2 | AC/G/03 | 950x330x943 | 70 | 8.0 | 7.1 | 67 | 8.75 | 7.79 | 6 | 240v, 50Hz - 1 PHASE | 25 |
| CU/1/01 | PURY-EP400YSNW-A | AC/1/01 - 08 & AC/1/16 - 17 | 1870x740x1858 | 468 | 50.0 | 45.0 | 62 | 16.1 | 16.1 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/1/02 | PURY-EP400YSNW-A | AC/1/09 - 15 & AC/1/18 - 20 | 1870x740x1858 | 468 | 50.0 | 45.0 | 62 | 16.1 | 16.1 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/1/03 | PURY-EP500YSNW-A | AC/1/21 - AC/1/33 | 1870x740x1858 | 468 | 63.0 | 56.0 | 64 | 17.0 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/2/01 | PURY-EP450YSNW-A | AC/2/01 - 08 & AC/2/17 - 19 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/2/02 | PURY-EP450YSNW-A | AC/2/09 - 16 & AC/2/20 - 22 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/2/03 | PURY-EP650YSNW-A | AC/2/23 - AC/2/36 | 2190x740x1858 | 515 | 81.5 | 73.0 | 69 | 20.3 | 24.4 | 8 | 415v, 50Hz - 3 PHASE | 2 x 25 |
| CU/3/01 | PURY-EP450YSNW-A | AC/3/01 - 08 & AC/3/17 - 19 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/3/02 | PURY-EP450YSNW-A | AC/3/09 - 16 & AC/3/20 - 22 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/3/03 | PURY-EP650YSNW-A | AC/3/23 - AC/3/36 | 2190x740x1858 | 515 | 81.5 | 73.0 | 69 | 20.3 | 24.4 | 8 | 415v, 50Hz - 3 PHASE | 2 x 25 |
| CU/4/01 | PURY-EP450YSNW-A | AC/4/01 - 08 & AC/4/17 - 19 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/4/02 | PURY-EP450YSNW-A | AC/4/09 - 16 & AC/4/20 - 22 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/4/03 | PURY-EP650YSNW-A | AC/4/23 - AC/4/36 | 2190x740x1858 | 515 | 81.5 | 73.0 | 69 | 20.3 | 24.4 | 8 | 415v, 50Hz - 3 PHASE | 2 x 25 |
| CU/5/01 | PURY-EP450YSNW-A | AC/5/01 - 08 & AC/5/17 - 19 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/5/02 | PURY-EP450YSNW-A | AC/5/09 - 16 & AC/5/20 - 22 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/5/03 | PURY-EP650YSNW-A | AC/5/23 - AC/5/36 | 2190x740x1858 | 515 | 81.5 | 73.0 | 69 | 20.3 | 24.4 | 8 | 415v, 50Hz - 3 PHASE | 2 x 25 |
| CU/6/01 | PURY-EP450YSNW-A | AC/6/01 - 08 & AC/6/17 - 19 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/6/02 | PURY-EP450YSNW-A | AC/6/09 - 16 & AC/6/20 - 22 | 1870x740x1858 | 468 | 56.0 | 50.0 | 63.5 | 16.1 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |
| CU/6/03 | PURY-EP500YSNW-A | AC/6/23 - AC/6/33 | 1870x740x1858 | 468 | 63.0 | 56.0 | 64 | 17.0 | 17.0 | 8 | 415v, 50Hz - 3 PHASE | 2 x 20 |

ALL EXTERNAL CONDENSER UNITS ARE AS MANUFACTURED BY MITSUBISHI

| REV | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 1 | 20.01.20 | RJM | INFORMATION/APPROVAL |

DRAWING STATUS: INFORMATION/APPROVAL

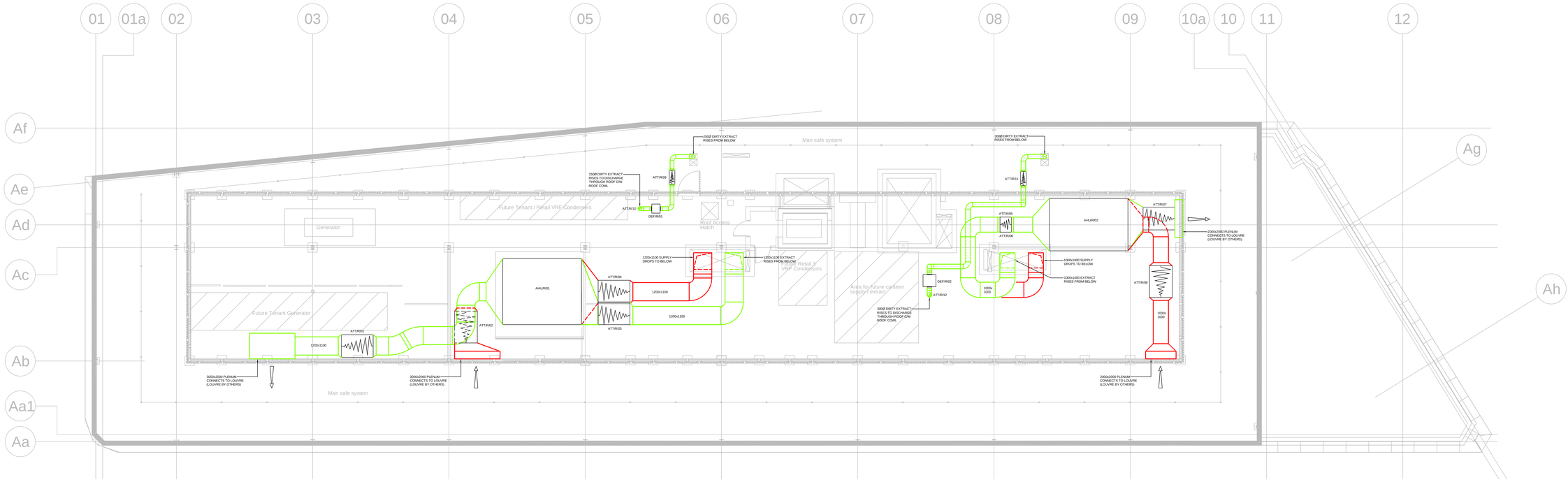
A. F. CONNELL LTD
INDUSTRIAL & COMMERCIAL
ELECTRICAL & MECHANICAL CONTRACTORS
1 ALFRED STREET, WEST VALE, HALIFAX, WEST YORKSHIRE, HX4 8LT.
TEL: 01422 310400, FAX: 01422 310033.
EMail: electrical@afconnell.com, mechanical@afconnell.com
204804 013296 F.4942/IW7811

PROJECT:
BRAZENNOSE HOUSE
OFFICE DEVELOPMENT
MANCHESTER

DRAWING TITLE:
MECHANICAL SERVICES
ROOF
AIR CONDITIONING SERVICES LAYOUT

| SCALE: | DRAWN: | CHECKED: | DATE: |
|---|---|---|---|
| 1:100 @ A0 | RJM | CPW | SEP '19 |

| PROJECT No: | DRAWING No: | REV: |
|---|---|---|
| C5784 | C5784-M-53-R-01 | 1 |




## ROOF AIR HANDLING UNIT SCHEDULE

| REFERENCE: | LOCATION: | MODEL: | DUTY (m3/s): | | RESISTANCE (pa): | DIMENSIONS (mm): | | | WEIGHT (kg): | ELECTRICAL: | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SUPPLY | EXTRACT | | H | W | L | | SUPPLY: | PHASE: | EXTRACT MP: | SUPPLY MP: |
| AHU/R/01 | ROOF | TEMPAIR 97T | 9.4 | 9.4 | 400 | 2750 | 4360 | 5200 | 6505 | 415v, 50Hz | 3 | 3 x 6 kW | 3 x 6 kW |
| AHU/R/02 | ROOF | TEMPAIR 84T | 6.13 | 6.13 | 400 | 2750 | 3460 | 5200 | 4980 | 415v, 50Hz | 3 | 2 x 6 kW | 2 x 6 kW |

AS MANUFACTURED BY AIRSOURCE VENTILATION LTD

## ROOF DIRTY EXTRACT FAN SCHEDULE

| REF: | MANUFACTURER: | MODEL: | DIMENSIONS (mm): (LxWxD) | NOISE (dba): | DUTY (m3/s): | ELECTRICAL DETAILS: | |
|---|---|---|---|---|---|---|---|
| | | | | | | PHASE: | FLC (Amps): |
| DEF/R/01 | AIR VENT TECH | EMT250/EC | 550x600x450 | 35 | 0.24 @ 200Pa | SINGLE | 1.4 |
| DEF/R/02 | AIR VENT TECH | EMT310/EC | 800x850x450 | 48 | 0.323 @ 200Pa | SINGLE | 3.1 |

## ROOF ATTENUATOR SCHEDULE

| REFERENCE: | MODEL: | SIZE (mm) LxWxH | AIR VOLUME (m3/s): |
|---|---|---|---|
| ATT/R/01 | SG02V/3C/LS | 1800x1400x1400 | 9.40 |
| ATT/R/02 | SG02H/3C/LS | 1800x1500x1350 | 9.40 |
| ATT/R/03 | SG01V/3C/LS | 1200x1500x1300 | 9.40 |
| ATT/R/04 | SG02H/3C/LS | 1800x1475x1325 | 9.40 |
| ATT/R/05 | SG01V/3C/LS | 750x1000x1000 | 6.13 |
| ATT/R/06 | SG01V/3C/LS | 600x1000x1000 | 6.13 |
| ATT/R/07 | SG02V/3C/LS | 2100x1400x1250 | 6.13 |
| ATT/R/08 | SG03H/3C/LS | 1500x1300x1000 | 6.13 |
| ATT/R/09 | PG01U/1K/L/ | 320x355Ø | 0.24 |
| ATT/R/10 | PG01U/1K/L/ | 320x355Ø | 0.24 |
| ATT/R/11 | PG01U/1K/L/ | 320x405Ø | 0.323 |
| ATT/R/12 | PG01U/1K/L/ | 320x405Ø | 0.323 |

ATTENUATORS ARE AS MANUFACTURED BY CAICE

| REV | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 2 | 16.03.20 | RJM | REVISED TO SUIT DESIGN TEAM COMMENTS |
| 1 | 20.01.20 | RJM | INFORMATION/APPROVAL |

DRAWING STATUS: INFORMATION/APPROVAL

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INDUSTRIAL & COMMERCIAL
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TEL: 01422 310400, FAX: 01422 310033.
EMail: electrical@afconnell.com, mechanical@afconnell.com
204804 013296 F.4942/IW7811

PROJECT:
BRAZENNOSE HOUSE
OFFICE DEVELOPMENT
MANCHESTER

DRAWING TITLE:
MECHANICAL SERVICES
ROOF
VENTILATION SERVICES LAYOUT

| SCALE: | DRAWN: | CHECKED: | DATE: |
|---|---|---|---|
| 1:100 @ A0 | RJM | CPW | DEC '19 |

| PROJECT No: | DRAWING No: | REV: |
|---|---|---|
| C5784 | C5784-M-57-R-01 | 2 |