Report

11th June 2021

TEMPLE

LEADERS IN ENVIRONMENT, PLANNING & SUSTAINABILITY.

Report for – Thornton Reynolds

T5281 – Holborn Links Estate, 20-22 Southampton Place and 46-47 Bloomsbury Square
Plant Noise Assessment

Document version control

Version	Date	Author	Reviewed by	Reviewed and approved by
1.0	11/06/2021	Sam Logan	Richard Budesha/ Norbert Skopinski	John Fisk

Report for: **Steve Reynolds**

Thornton Reynolds

10A Lant Street

London

SE1 1QR

Main contributors: **Sam Logan**

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Executive Summary

Temple Group has been appointed by Thornton Reynolds Ltd to undertake a preliminary plant noise assessment for equipment proposed as a part of the redevelopment of 20-22 Southampton & 46-47 Bloomsbury Square. This office development includes installation of condensers and extractor fans.

This report presents criteria for plant noise emissions, the methodology, and results of an external noise survey undertaken at the site to establish the background noise levels in the area. These have been used to assess the impact of the proposed plant on the nearest noise sensitive receptors.

Camden Council's policy documents express their requirement that the external Rating Level emitted from the building services plant to be lower than the Background sound level by 10dB (15dB if tonal components are present) at the nearest noise sensitive receptors.

Based on the manufacturer's sound pressure level data, it is predicted that noise emissions will be adequately controlled during the daytime. During the night-time, plant noise levels will be at least 8dBA below the Background, which can be reduced by 2dBA to comply with Camden Council's noise limits by use of acoustic barriers or alternative plant layouts.

1.0 Introduction

Proposals are in place to install new plant at 20, 21 and 22 Southampton Place and 46 and 47 Bloomsbury Square as part of the proposed development. Temple has been appointed to undertake a noise assessment for the new building services plant, that would be installed at various elevations throughout the development.

The purpose of the noise assessment is to assess the impact on nearby noise sensitive receptors and, where required, to provide outline mitigation measures for further noise attenuation. The assessment has been carried out in line with the guidance from Camden Council and relevant national standards.

The following sections of the report describe criteria for plant noise emissions, assessment methodology, external noise measurement methodology, along with results of the assessment of the proposed plant.

The acoustic terminology used in this report is explained in **Appendix A**.

2.0 Policy, Standards and Guidance related to Noise Emission Limits

2.1 Standards and Guidance

British Standard 7445 – Description and *Measurement of Environmental Noise*

British Standard 7445 Part 1 (BS 7455-1:1991)[1] defines the basic quantities to be used for the description of noise in community environments and describes basic procedures for the determination of these quantities.

The methods and procedures described in this British Standard are intended to be applicable to sounds from all sources, individually and in combination, which contribute to the total noise at a site.

British Standard 7445 Part 2 (BS 7455-2:1991)[2] describes methods for the acquisition of data which provide descriptors that enable:

a) a description of the environmental noise in a specified area of land to be made in a uniform way;

b) the compatibility of any land use activity or projected activity to be assessed with respect to existing or predicted noise; and

c) Using the data as a basis, authorities may establish a system for selecting the appropriate land use, as far as levels of noise are concerned, for a specified area, or the sources of noise - existing or planned - which are acceptable with respect to land use, existing or planned.

British Standard 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

British Standard 4142 (BS 2014+A1:2019)[3] describes methods to use outdoor sound levels to assess the likely effects of sound of an industrial and/or commercial nature on people who might be inside or outside a dwelling or premises used for residential purposes upon which the sound is incident.

The standard requires determination of the following:

- Rating level - $L_{Aeq,Tr}$ sound level produced by the specific sound source at the assessment location with any adjustment added to the specific sound level if a tone, impulse or other acoustic characteristic occurs, or is expected to be present.
- Background sound level, $L_{A90,T}$ – A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T.

[1] British Standards Institute (BSI), (1991): 'BS 7445 – Description and Measurement of Environmental Noise. Part 1: Guide to Quantities and Procedures'. BSI, London.

[2] British Standards Institute (BSI), (1991): 'BS 7445 – Description and Measurement of Environmental Noise. Part 2: Guide to the Acquisition of Data Pertinent to Land Use'. BSI, London.

[3] British Standards Institute (BSI), (2014+A1:2019): 'BS 4142 – Methods for rating and assessing industrial and commercial sound

- T_r is the reference time interval over which the specific sound level is determined. This is 1-hour for daytime (07:00-23:00 h) and 15-minutes for night-time (23:00-07:00 h).

An estimate of the impact of the specific sound generated can be obtained by subtracting the measured background sound level from the rating level, and the following is considered:

a) Typically, the greater this 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.

The assessment methodology considers the Specific Sound Level, as measured or calculated at a potential noise sensitive receptor, due to the sound under investigation. A correction factor is added to this level to account for the acoustic character of the sound as follows:

- Tonality – A correction of up to 6dB depending on the prominence of tones;
- Impulsivity – A correction of up to 9dB depending on the prominence of impulsivity;
- Other sound characteristics – A 3dB correction may be applied where a distinctive acoustic character is present that is neither tonal nor impulsive;
- Intermittency – A 3dB correction may be applied where the specific sound has identifiable on-off conditions.

All pertinent factors should be taken into consideration when assessing the impact, including the following:

- 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.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor.

2.2 Local Authority Requirements

Camden Local Plan 2017

The Camden Local Plan[4] was adopted by council on the 3rd of July 2017. It replaces the core strategy and Camden Development Policies as the basis for planning decisions and future development in Camden.

Policy A1 Managing the Impact of development states:

"The Council will seek to protect the quality of life of occupiers and neighbours. We will grant permission for development unless this causes unacceptable harm to amenity".

Noise and vibration levels are factors that are considered under Policy A1.

Policy A4 Noise and vibration states:

"The council will seek to ensure that noise and vibration is controlled and managed.

Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3). We will not grant planning permission for:

- *Development likely to generate unacceptable noise and vibration impacts; or*
- *Development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.*

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development."

Appendix 3 of the Camden Local Plan 2017 sets out the noise thresholds for industrial and commercial noise sources, it states the following:

"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15 dB if tonal components are present) should be considered as the design criterion."

[4] Camden Local Plan, 2017. Camden Council

Table 2.1 Camden Local Plan Appendix 3 Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing noise sensitive receptor	Assessment location	Design period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Dwellings	Garden used for main amenity (free field) and outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings	Outside bedroom window (façade)	Night	'Rating level' 10dB below background and no events exceeding 57dB L_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background or events exceeding 88dB L_{Amax}

2.3 Consultation

On Wednesday 21st April, Richard Budesha, a consultant at Temple contacted the Camden Council noise team (RegulatoryServices@camden.gov.uk) via email. The correspondence summarised the proposed methodology for undertaking the noise survey and subsequent plant noise assessment. At the time of writing this report (11th June 2021) no response has been received.

3.0 The Site and its Surroundings

20 to 22 Southampton Place are located on the east side of Southampton Place, WC1A 2AL; between Barter Street, WC1A 2AL, and Bloomsbury Square, WC1A 2RA. 46 and 47 Bloomsbury Square are on the northwest corner of Bloomsbury Square and Southampton Place. The location of the site is indicated in Figure B.1 in **Appendix B**.

The site is close to Holborn station and the surroundings include residential and commercial use buildings. The nearest noise sensitive residential receptor to the proposed plant locations on 20 to 22 Southampton Place and 46-47 Bloomsbury Square were noted to be the properties within 21 Barter Street within 10m the edge of 20 Southampton Place roof. Additional residential receptors were identified as the flats above the businesses on the opposite side of Southampton Place; approximately 20m away from the proposed plant locations on the roof of 20 Southampton Place.

The client has proposed to install the following external plant (assumed to be operating 24/7):

20 Southampton Place

- 1 Lower Ground Floor WC Extraction Fan;
- 1 Ground Floor Tea Point Extraction Fan;
- 1 First Floor Tea Point Extraction Fan;
- 1 Second Floor Tea Point Extraction Fan;
- 1 Third Floor Tea Point Extraction Fan;
- 1 Fourth Floor Tea Point Extraction Fan; and
- 2 Roof-level Condensers.

21 Southampton Place

- 1 Lower Ground Floor Kitchenette Extraction Fan;
- 1 Ground Floor WC Extraction Fan;
- 1 First Floor WC Extraction Fan;
- 1 Second Floor WC Extraction Fan;
- 1 Third Floor WC Extraction Fan; and
- 4 Roof-level Condensers.

22 Southampton Place

- 1 Roof-level Extraction Fan; and
- 4 Roof-level Condensers.

46 Bloomsbury Square

- 1 Lower Ground Floor Shower and WC Extraction Fan.

47 Bloomsbury Square

- 1 Lower Ground Floor WC Extraction Fan;
- 1 Lower Ground Floor Kitchenette Extraction Fan;
- 2 Lower Ground Floor Condensers;
- 1 Ground Floor WC Extraction Fan;
- 1 Ground Floor Tea Point Extraction Fan;
- 1 First Floor WC Extraction Fan;
- 1 First Floor Tea Point Extraction Fan;
- 1 Second Floor WC Extraction Fan;
- 1 Second Floor Tea Point Extraction Fan;
- 1 Third Floor WC Extraction Fan;
- 1 Third Floor Tea Point Extraction Fan;
- 1 Fourth Floor Extraction Fan; and
- 5 Roof-level Condensers.

Figures C.1 to C.7 in **Appendix C** show the layout of the proposed plant at 20 to 22 Southampton Place and 46-47 Bloomsbury Square.

Plant Specification sheet data can be found in **Appendix D**, the data from which has been summarised below in **Table 3.1 and Table 3.2**.

Table 3.1 Condenser noise data during heating (Sound pressure Level at 1m)

	Octave Band Sound Pressure Level at 1m Hz (dB)							
Model	63	125	250	500	1000	2000	4000	8000
PUMY-SP112VKM	58.0	55.0	54.5	51.5	49.5	45.0	38.0	32.0
PUMY-SP125VKM	60.0	58.5	56.0	53.0	52.0	46.5	40.5	33.5
PUMY-SP140VKM	62.5	57.5	56.0	53.0	51.5	47.0	40.5	33.5

Table 2.2 Extract fan noise data at full speed (Sound Power Level)

	Octave Band Sound Power Level Hz (dB)							
Model	63	125	250	500	1000	2000	4000	8000
Typical WC Fan GENIE-DCE-H	45.0	42.0	41.0	35.0	33.0	27.0	23.0	25.0
Typical Kitchenette, Tea Point and Shower Fan GENIE-DCE-H	51.0	50.0	50.0	49.0	48.0	44.0	38.0	33.0
No 46 LG Shower Fan DE1-ES	52.0	52.0	45.0	42.0	30.0	28.0	25.0	16.0
No 22 Fan DE6-ES	75.0	68.0	67.0	53.0	54.0	43.0	38.0	32.0
No 20 Tea Point Fan GENIE-DCE-H	51.0	50.0	50.0	49.0	48.0	44.0	38.0	33.0

4.0 Measurement Methodology

4.1 Unattended Monitoring

An unattended environmental noise survey was carried out between Monday 10th May 2021 and Monday 17th May 2021 to obtain prevailing noise levels representative of the closest sensitive receptors to the site.

Measurement Position 1 (MP1) was located on the eastern edge of the roof, towards the residential properties on the opposing side of Southampton Place. Measurement Position 2 (MP2) was located on the western edge of the roof of 22 Southampton Place facing the nearest residential receptor on Barter Street. These locations were chosen to measure noise levels representative of those at the nearest/worst affected noise sensitive locations. The measurement microphone in each case was positioned at a height of approximately 2m above the roof level and 3.5m away from any reflective façade and are considered to be free-field measurements. The measurement positions are shown in **Figures B.2 and B.3** in **Appendix B**.

The noise monitors were set up to automatically store statistical and spectral data every 15 minutes during the measurement period. Continuous road traffic noise from High Holborn (A40) to the south and Bloomsbury Square to the north was observed to be the dominant noise sources. Occasional traffic moved along Southampton Place and sirens were heard to the west and on High Holborn during installation and collection of the monitors.

4.2 Equipment

The measurement equipment used is detailed in **Table 4.1**. The microphones were fitted with a windshield and appropriate corrections applied. Field calibration checks were carried out prior to and post measurement, and no variation occurred. Calibration certificates are available upon request.

Table 4.1 - Survey equipment

Manufacturer	Item	Type	Serial Number
RION	Sound Level Meter	NL-52	00410086
RION	Sound Level Meter	NL-52	00510141
RION	Calibrator	NC-74	34936353

4.3 Meteorological Conditions

To verify that periods of adverse weather conditions did not significantly impact the results, the local precipitation and wind speed levels were collected using Wundermap[5] weather data from weather station EGLC at London City Airport, approximately 10 km from Southampton Place. No other weather stations closer had full data for the duration for the survey.

Appendix E shows the L_{A90} results and the precipitation and wind speed data for the duration of the survey. Periods of the survey in which wind speeds exceeded the recommended maximum limits of 5 m/s were removed in accordance with guidance set out in British Standard 4142 (BS 2014+A1:2019). It was established there were no periods of heavy precipitation during the survey.

[5] Weather Underground https://www.wunderground.com/weather/gb/london-city/EGLC

5.0 Noise Survey Results

5.1 Unattended Measurement Results

In line with BS 4142:2014+A1:2019, representative typical background sound levels have been determined using statistical analysis of the continuous measurements. Day and night-time $L_{A90,15min}$ representative background sound levels measured during the unattended survey for each measurement position are presented in **Table 5.1**.

Full statistical measurement data is presented in **Figures F.1 to F.4** in **Appendix F** with spectral data available on request.

Table 5.1 – Representative typical background noise levels

Measurement Position	Representative Receptor	Daytime $L_{A90, 15mins}$	Night-time $L_{A90, 15mins}$
MP1	Southampton Place	50dB	47dB
MP2	21 Barter Street	49dB	47dB

6.0 Assessment

Due to the distance separation, screening from the building edge, and various types of plant, a 3D CadnaA noise model was prepared to predict the resultant noise levels at the identified sensitive receptors. Screenshots from the model are shown in **Appendix G**.

6.1 Plant Noise Assessment

The total noise level from all plant items operating simultaneously at worst case noise levels (during heating for condensers and fans operating at full speed) was calculated at 1m from the facades of the nearest noise sensitive receptors. Data collected from MP2 was used as it represented the closest sensitive receptor and had the lowest background level. The results are summarised in **Table 6.1.**

Calculations for the condenser units have been based on the manufacturer's measured octave band sound pressure level data at 1m.

Table 6.1 - BS4142 assessment of residential receptor on 21 Barter Street, from MP2

Results		**dB (day)**	**dB (night)**	
Background Sound Level	$L_{A90,15mins}$	49	47	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, 15 minutes.
Assessment made for seven consecutive days; reference time interval is 15mins. The plant is proposed to be operating 24/7 as described in Section 3.0.				
Distance Attenuation	N/A	N/A	N/A	Considered in noise modelling software
On Time Correction	N/A	N/A	N/A	Considered in noise modelling software
Specific Sound Level	$L_{Aeq,T}$	39	39	Specific sound level at worst affected receptor calculated in CadnaA.
Acoustic feature correction	Tonality	0	0	1/3rd Octave band data not available.
	Intermittency	0	0	Normal use of the plant means that it is on constantly. As such, it is assumed that correction is not required.
	Impulsivity	0	0	Temple was not provided with information that the proposed plant will have impulsive sound features, but experience of similar equipment indicates that this is unlikely to be the case.
	Other Sound Characteristics	0	0	No other sound characteristics are known at this stage of the assessment.
Rating Level		39	39	Rating level including acoustic feature corrections
Excess of rating level over background sound level		-10	-8	The rating level is 10dB and 8dB below the day and night-time background sound levels respectively. The assessment indicates that the specific sound source is likely to have a medium impact (Amber) in line with Camden Council noise limits during the night-time only.
It should be noted that the above assessment assumes no correction for tonality, impulsivity, other distinctive acoustic character, or intermittency. Consequently, all sources should be controlled so that these issues are not present at noise sensitive locations or else corrections will need to be applied.				

Calculations undertaken have assumed omnidirectional radiation from all condenser units and therefore provide a worst-case assessment. In practice, the specific sound level is likely to be lower than stated at the nearest sensitive receptors due to the directionality of the units (which we were unable to account for in the model) and their layout (facing away from nearest sensitive receptors). Hence it is likely that in practice the noise level will be marginally more than 10dB below the background during the night-time and comply with the Camden Council criteria.

6.2 Mitigation

Should further mitigation be required during the night-time, a 2dB attenuation may be achieved through changes to the two rear condensers on the roof of 21 Southampton Place (CU-20/21-R and CU-20-R) and all four condensers on the roof of 22 Southampton Place due to their proximity to the nearest noise sensitive receptors. The three options available are:

- Move all condensers away from the western edge of 21 and 22 Southampton Place by **2m**. This will reduce the specific sound level at worst affected receptor to 37dBA, achieving the 10dB below the background.
- Construct a **1.5m** tall acoustic screen between the edge of the building and the above condensers, spanning the width of the roof at these locations on 21 and 22 Southampton Place. This will reduce the specific sound level at worst affected receptor to 36dBA, achieving the 11dB below the background.
- A combination of the above, for example moving a shorter distance combined with a lower barrier, may also achieve the performance required if there are limitations with the above two options.

Moving the condensers away from the western edge has a negligible effect on the residential receptors on the opposing side of Southampton Place.

As the design progresses, all sources should be selected and/or controlled such that tonality, impulsivity, or other distinctive acoustic characteristics are not present at noise sensitive locations.

7.0 Conclusion

Temple Group has been appointed by Thornton Reynolds Ltd to undertake a preliminary plant noise assessment for equipment proposed as a part of the redevelopment of 20-22 Southampton Place and 46-47 Bloomsbury Square.

Temple has undertaken an unattended noise survey and calculations of the rating noise level of the proposed mechanical plant which has been used to assess the effects of the proposed mechanical plant on the nearest noise sensitive receptors to the proposed development. This has been assessed in line with the Camden Council guidance and relevant national standards.

The assessment indicates that the predicted rating noise level of the mechanical plant will be 10dB and 8dB below the typical background sound level at the nearest noise sensitive receiver. This complies with the Camden council criteria during the day but exceeds the criteria by 2dB at night. The calculation is, however, worst case and due to the directionality of the sound propagation from the units (which we were unable to account for in the model) it is likely that in practice the noise level will be marginally more than 10dB below the background during the night-time and comply with the Camden Council criteria.

Should further mitigation be required a further 2dBA attenuation may be achieved by use of acoustic screening or an alternative plant layout.

Appendix A. Acoustic Terminology

Noise/Sound

Noise and sound need to be carefully distinguished. Sound is a term used to describe wave-like variations in air pressure that occur at frequencies that can stimulate receptors in the inner ear and, if sufficiently powerful, be appreciated at a conscious level. Noise implies the presence of sound but also implies a response to sound: noise is often defined as unwanted sound.

Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic, and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0dB (which corresponds to a reference sound pressure of 20 µPa) and the threshold of pain is around 120dB.

Frequency, Hz

Frequency is the number of occurrences of a repeating event per unit second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is usually divided up into octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency. The bands are described by their centre frequency value. In environmental acoustics the ranges typically used are from 63 Hz to 8 kHz.

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

Ambient sound

Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far.

Ambient sound level ($L_{Aeq,T}$)

Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.

Background sound level ($L_{A90,T}$)

A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90 % of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

Rating level

Specific sound level plus any adjustment for the characteristic features of the sound.

Reference time interval

Specified interval over which the specific sound level is determined. This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.

Residual sound

Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

Residual sound level ($L_{Aeq,T}$)

Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.

Specific sound level

Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval.

Specific sound source

Sound source being assessed.

Appendix B. Current Site Layout and Measurement Positions

Figure B.1 – Current site layout and survey locations. Approximate position of the nearest noise sensitive receptors, 21 Barter Street & Properties on the other side of Southampton Place, are marked in yellow.

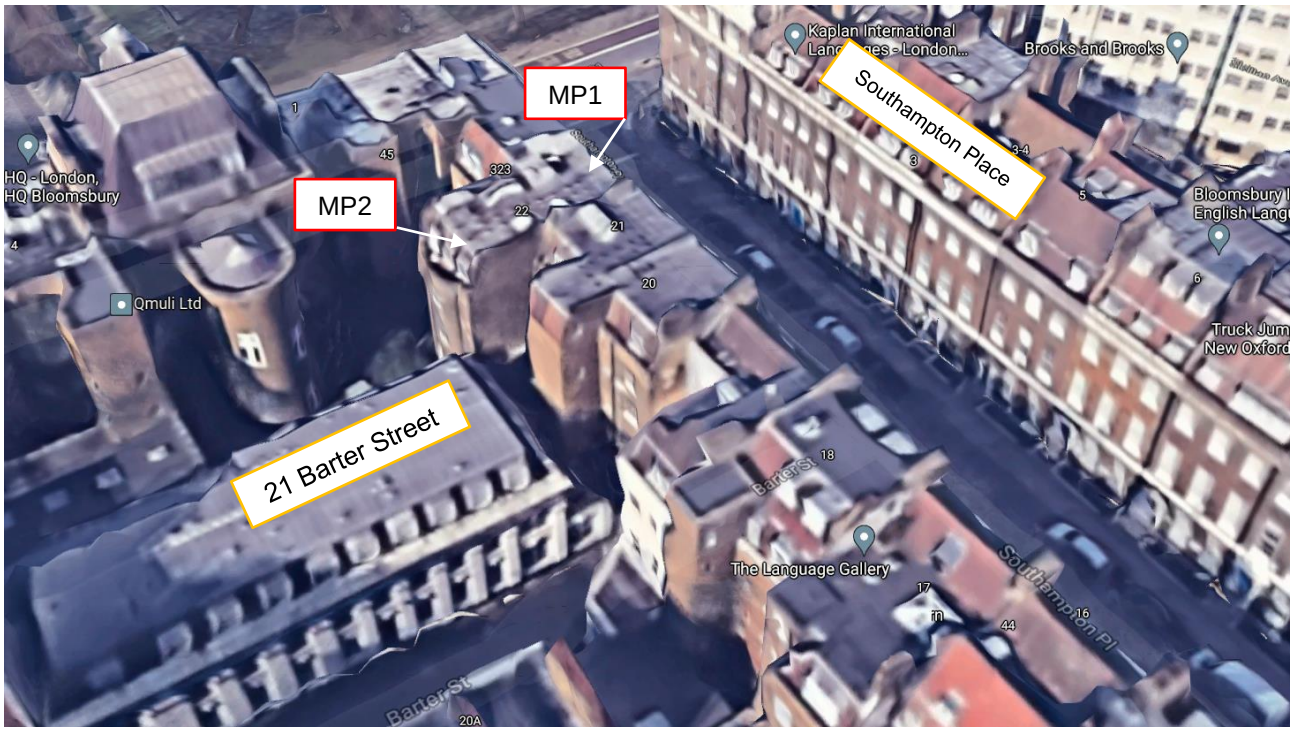
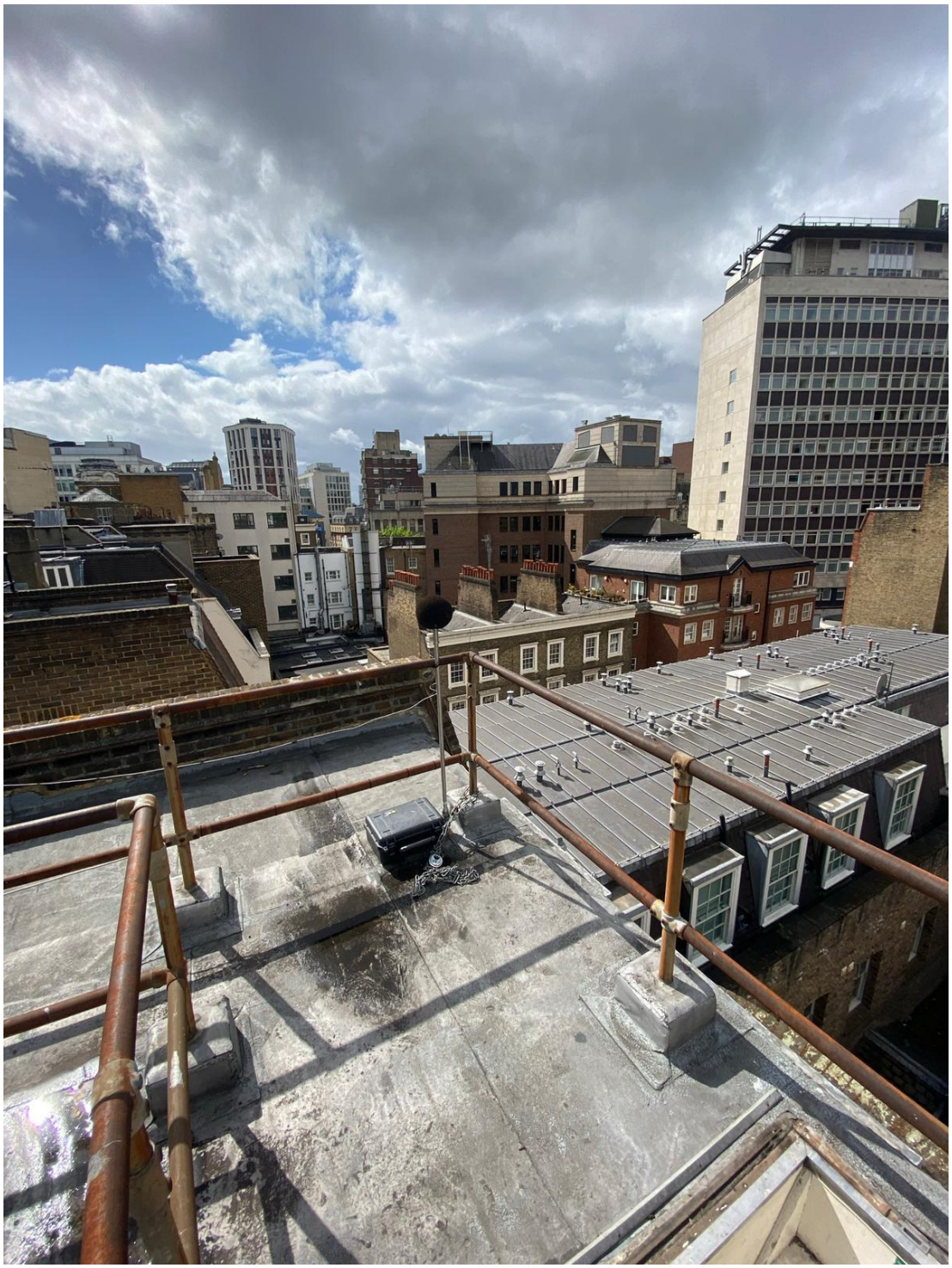


Figure B.2 - Measurement Position 1 (MP1), Eastern boundary of 22 Southmapton Place facing the residential receptors on the opposite side of Southampton Place.

Figure B.3 - Measurement Position 2 (MP2), Western boundary of 22 Southampton Place facing towards the nearest residential recptor at the rear on Barter Street.



Appendix C. Layout of Proposed Plant

Figure C.1 – Proposed Plant, Roof Level

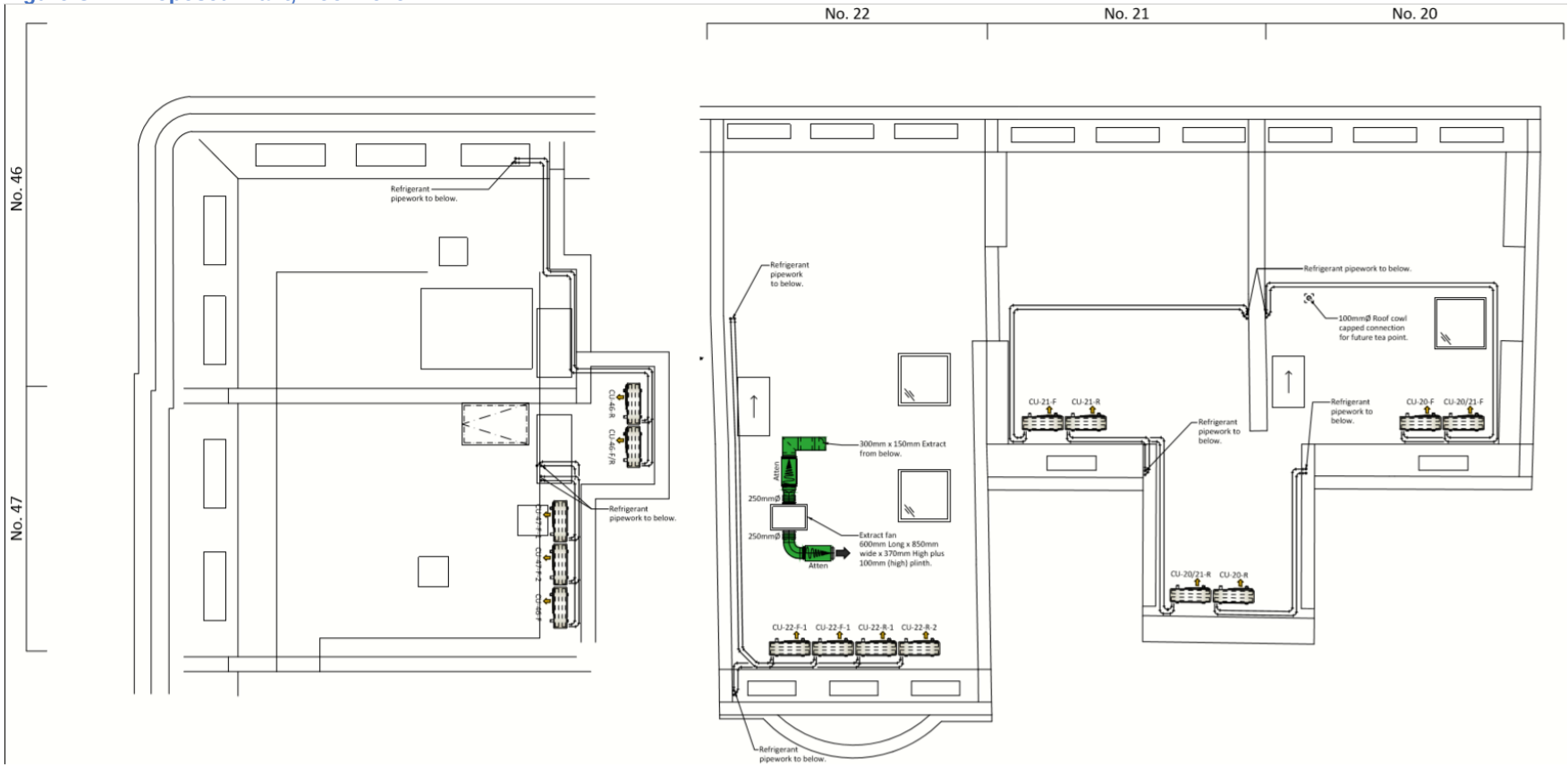


Figure C.2 – Proposed Plant, Fourth Floor

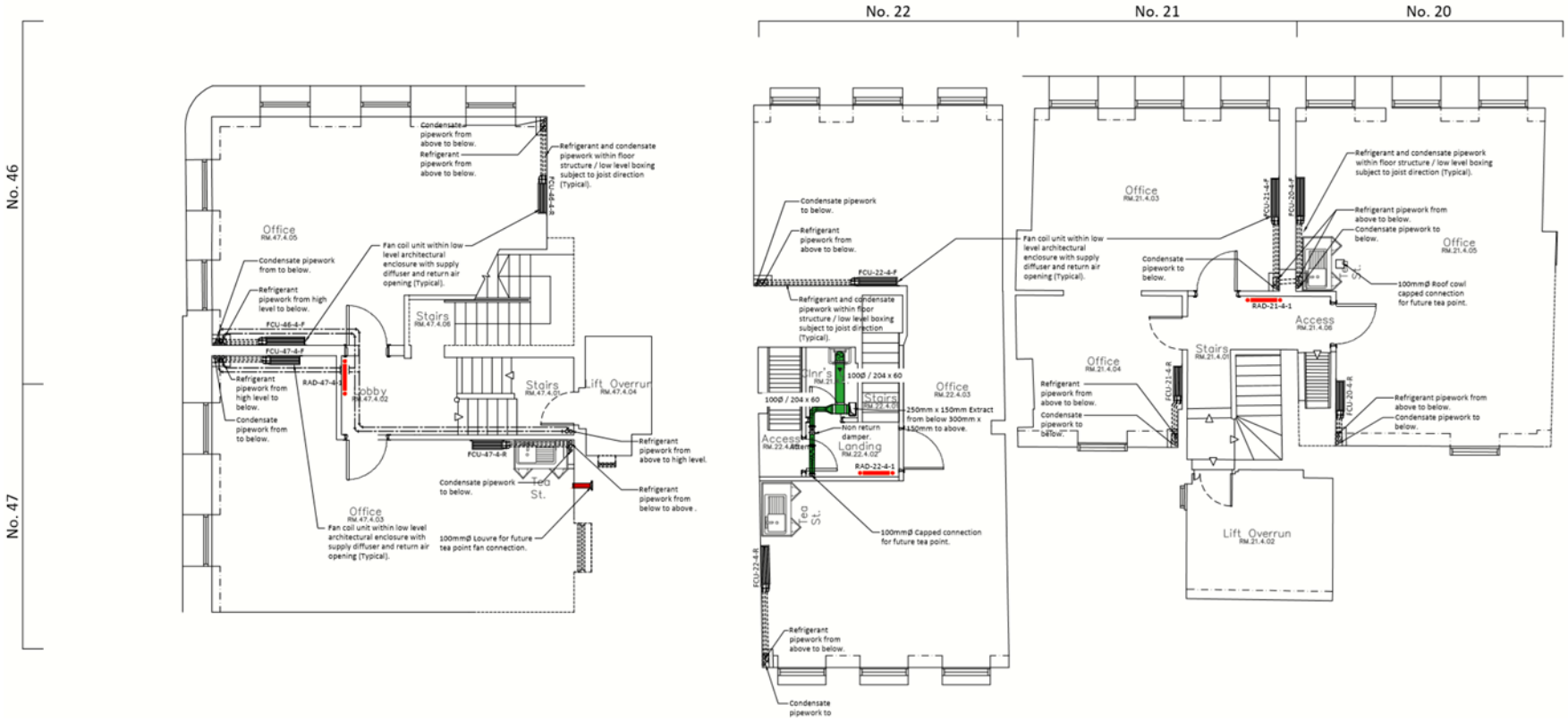


Figure C.3 – Proposed Plant, Third Floor

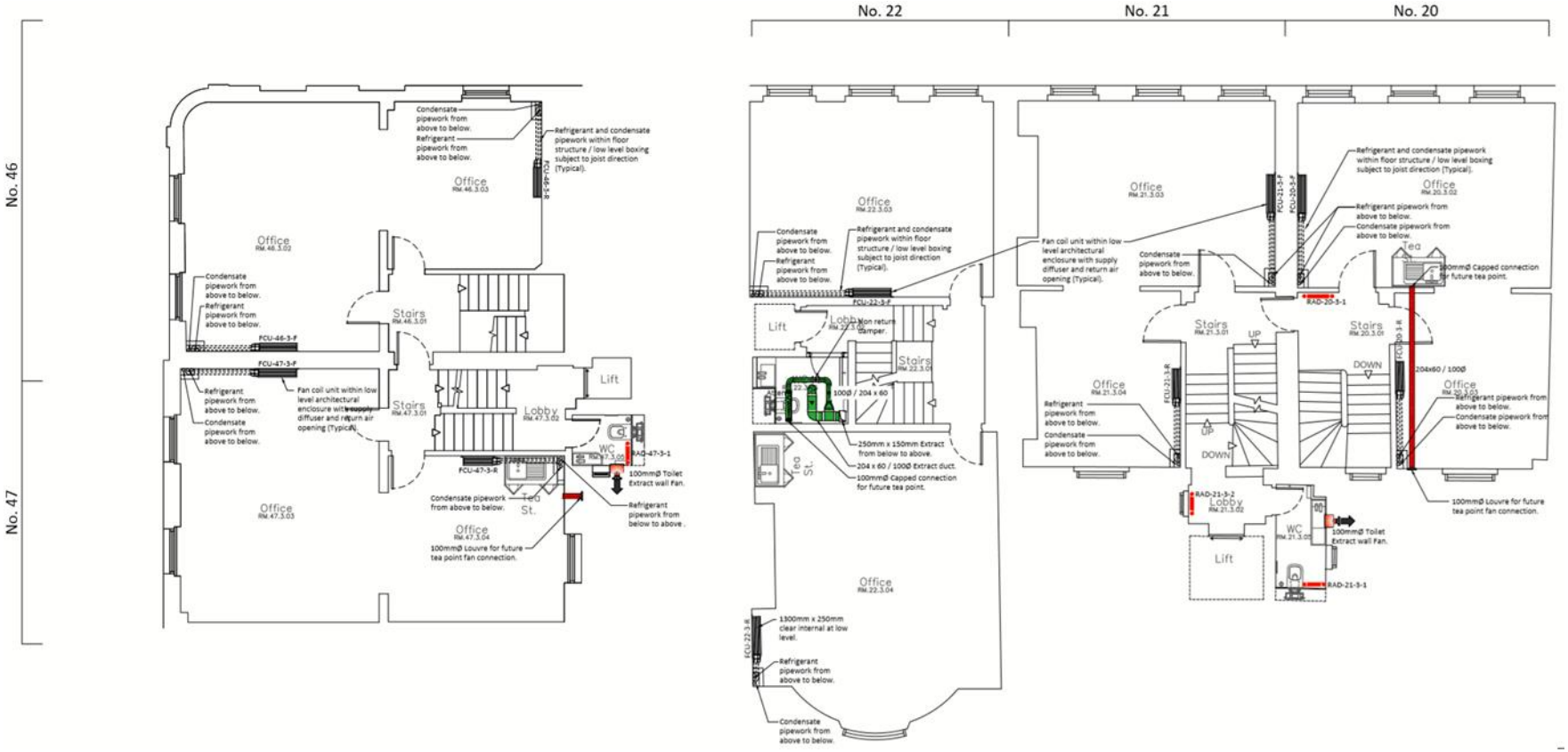


Figure C.4 – Proposed Plant, Second Floor

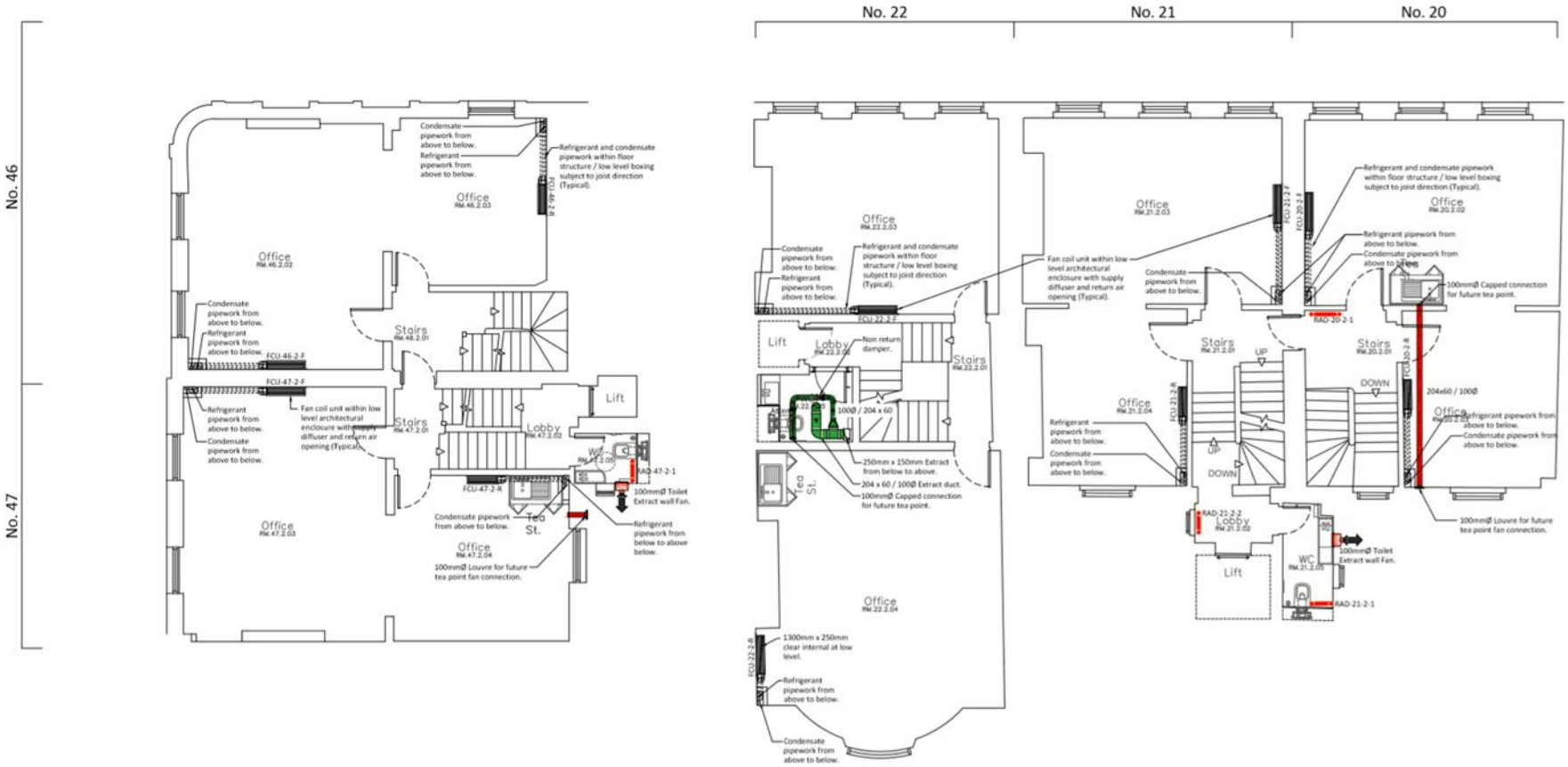


Figure C.5 – Proposed Plant, First Floor

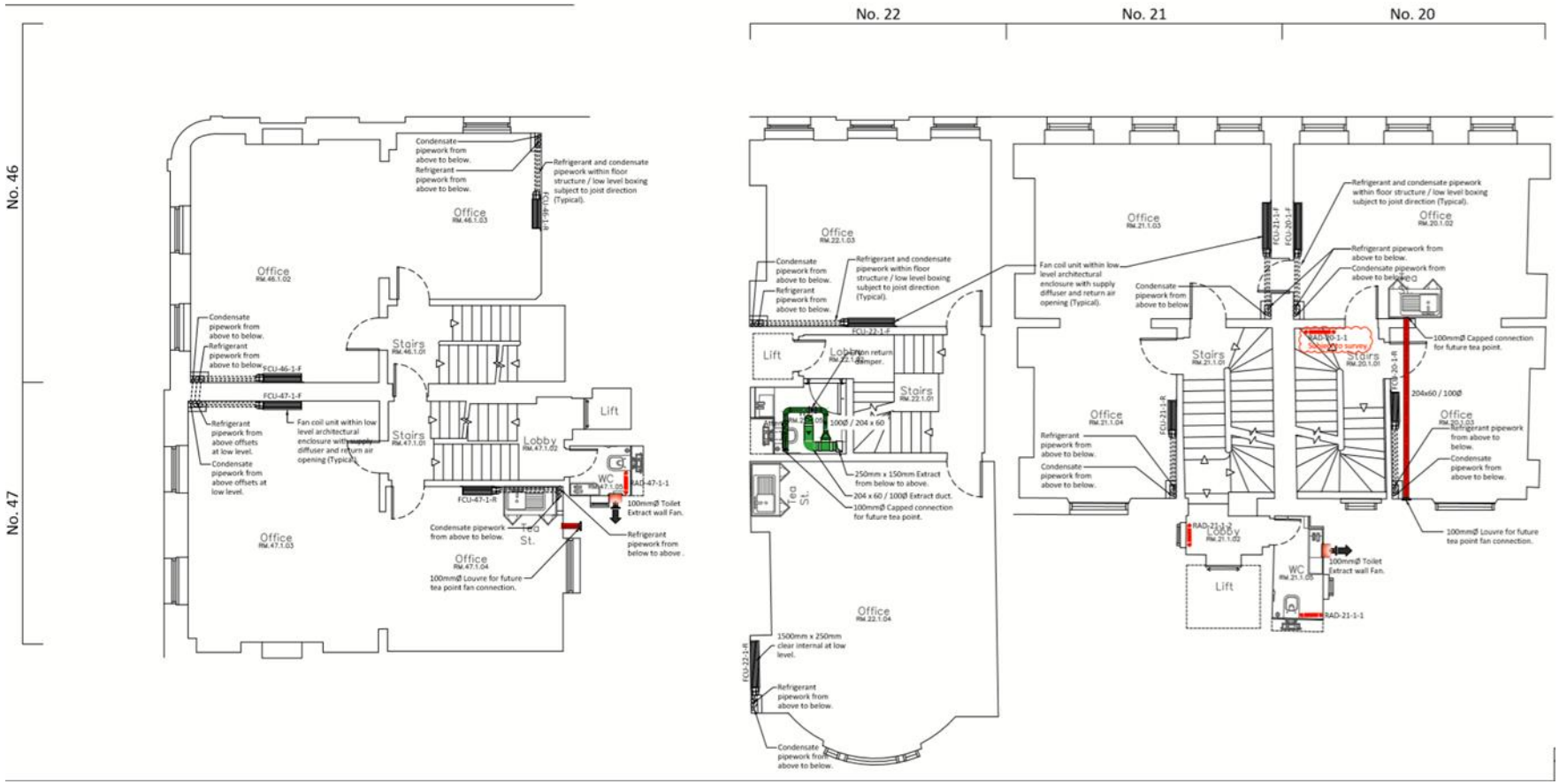


Figure C.6 – Proposed Plant, Ground Floor

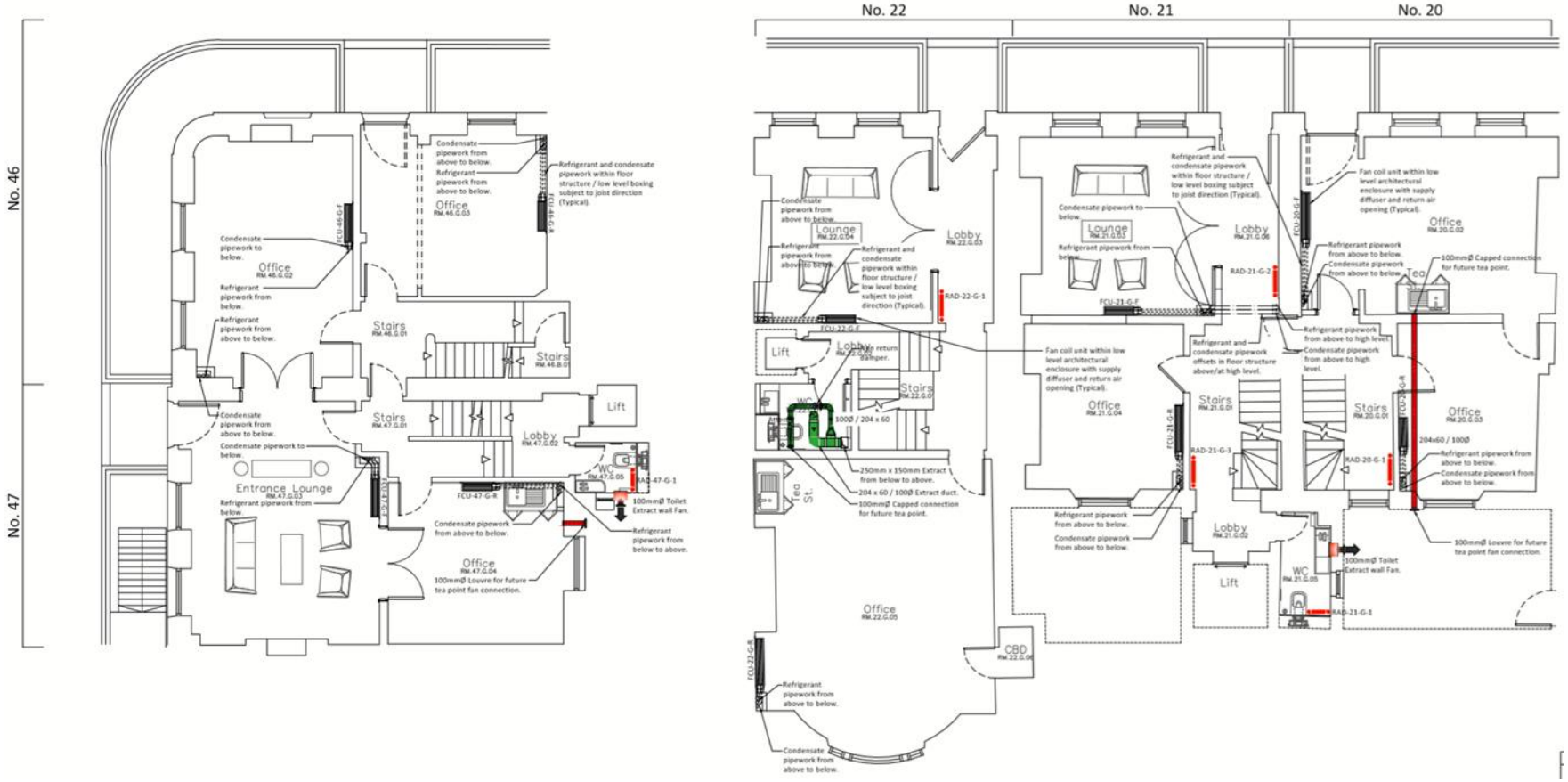
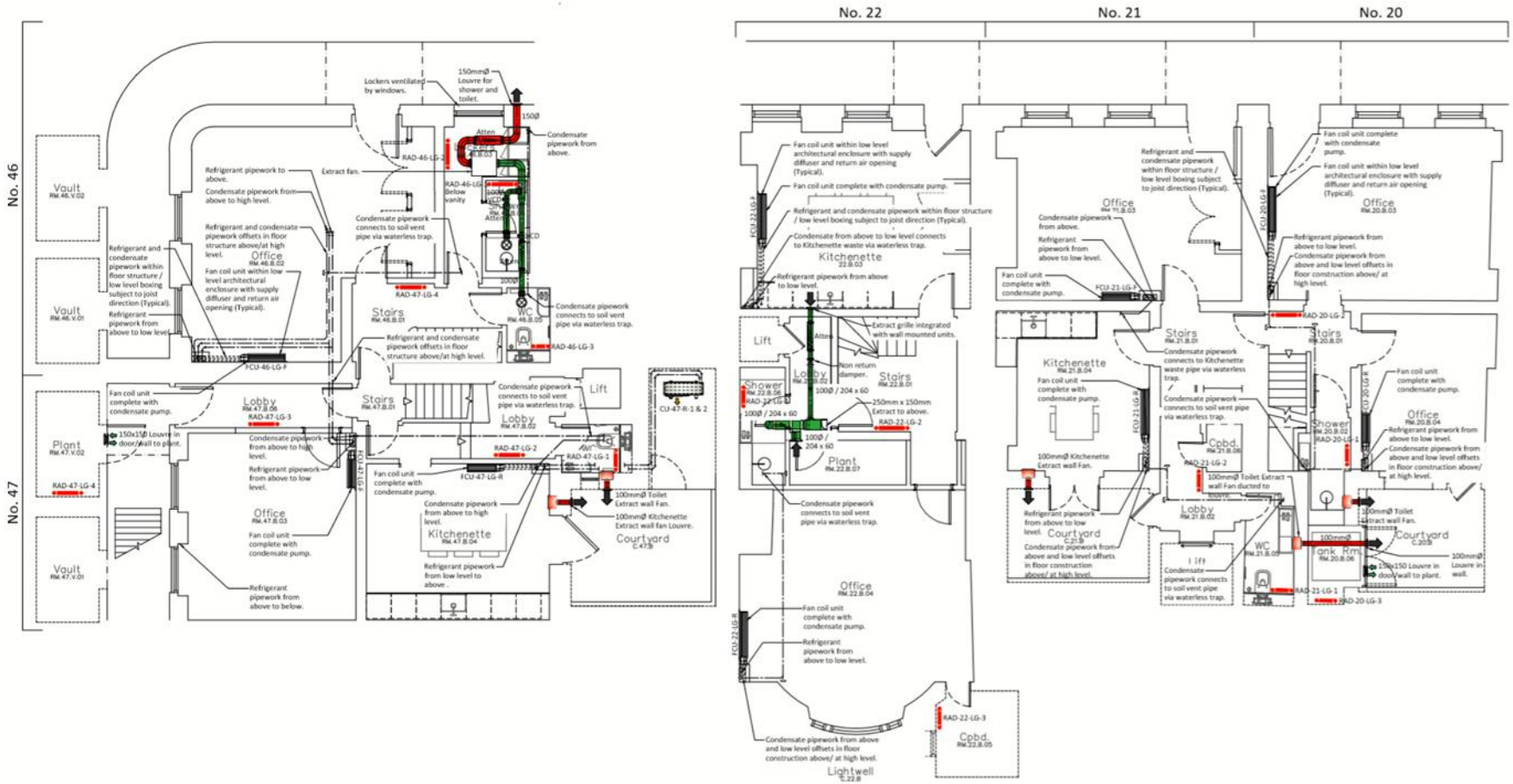


Figure C.7 – Proposed Plant, Lower Ground Floor



Appendix D. Preliminary Plant Data

Figure D.1 - Typical WC Extractor Fan

nuaire SUMMARY FAN DATA SHEET

Nuaire Limited, Western Industrial Estate, Caerphilly, CF83 1NA, United Kingdom. email:info@nuaire.co.uk
UK Commercial Enquiries T:029 2085 8200 UK Residential Enquiries T:029 2085 8500 International Enquiries T:+44.29 2085 8497

Whilst the information given on this data sheet is fan specific, it is in summary and reference to the product selection catalogue and installation & maintenance documents is recommended.
This data sheet produced on 07 May 2021 13:03 using software version 3.6.19.2088 - 12-Mar-2018

Technical Data

Genie-DCE - Decentralised Mechanical Extract Fan
Decentralised Mechanical Extract Fan

Fan Code:	**GENIE-DCE-H**
Installation Manual Links:	671504
Required Duty:	6 l/s @ 0 Pa
Actual Duty:	13 l/s @ 0 Pa
Actual at Required Flow:	6 l/s @ 74 Pa
Velocity at Actual Duty:	m/s
When Speed Controlled to Required Duty (46.1%):	
Velocity at Required Duty:	m/s
Motor Input Power:	**0.001 kW**
Specific Fan Power:	**0.1 W/(l/s)**
Motor Efficiency:	0 %
Maximum Fan Input Power:	0.007 kW
Motor Input Power:	0.009 kW
Specific Fan Power:	0.7 W/(l/s)
Nominal Fan Speed:	2 Pole 1,000 RPM
Electrical Supply:	230 V 1 Phase 50 Hz
Motor Rating:	0.003 kW
Motor Current:	flc: 0.003 A
Motor Current:	sc: 0.014 A
Max. Operating Temp.:	40°C
Weight:	1 kg

Sound Data

Acoustic perfomance to ISO 13347 and AMCA 300.

Sound Power Levels re 1 pWatts (Hz):

	63	125	250	500	1k	2k	4k	8k	dBA
Induct Inlet	40	36	32	23	16	<16	<16	<16	<16

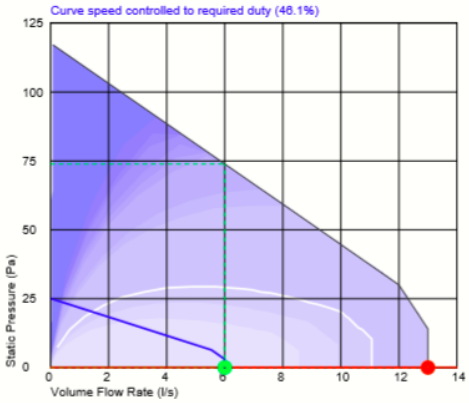
The above spectrums running speed controlled to required duty (46.2%). When running at full speed:

Induct Inlet	45	42	41	35	33	27	23	25	20

dBA is hemi-spherical at 3 metres. For spherical deduct 3 dBA.

Please note that the noise data stated on this data sheet for the unit and/or silencer is tested in accordance with UK, European and International industry laboratory standards. However onsite conditions may vary and we would recommend that this information is verified by an acoustic specialist in order to ensure its suitability for the intended application.

Performance Curve



Specification

Unit shall be SAP Appendix Q eligible.

Under wind load conditions the unit will be capable of maintaining it's set flowrate to within 5%.

The unit shall be surface mountable incorporating a push fit, washable filter with an area of 23,750mm² and capable of conversion, if necessary, to semi-recessed format using flange supplied or window mounting format using optional fixing kit.

Unit noise level shall not exceed 20dBA @3m for kitchens and 16dBA for wet rooms (normal running).

The unit shall incorporate an injection moulded forward curved centrifugal impeller.

The impeller shall be directly driven by a low energy, high efficiency 12V DC motor, fitted with sealed, self lubricating ball bearings.

Motors shall have locked rotor protection to prevent overheating in the event of fan failure.

The fan/motor assembly and the unit control assembly shall be capable of replacement as "plug in" modules without disturbing the field wiring.

Each unit is capable of being set to comply with new edition (2010) Part F - ventilation building regulations for (System 3) continuous mechanical extract (MEV) and new edition (2010) Part L - conservation of fuel and power.

Units shall be fitted with a run-on timer facility (1-60 minutes), from switched live signal only.

Fan status indication to be visible on front of unit, with flashing LED to show fan failure.

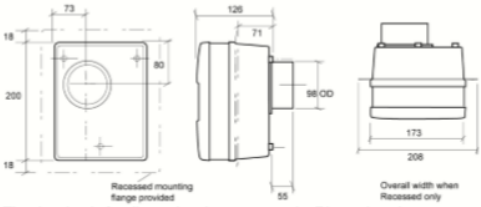
Plastic casing to be manufactured from flame retardant materials.

The unit shall be designed for quietest operation to ensure occupant satisfaction.

The unit shall incorporate electrical connections to allow for the unit's "boost" airflow to be triggered by either pull-cord or switched live.

The unit shall be supplied with a 5 year warranty. .

Fan Dimensions



The drawing is for dimensional purposes only. Dimensions in mm.

Figure D.2 - Typical Kitchenette, Tea Point and Shower Extraction Fan

nuaire SUMMARY FAN DATA SHEET

Nuaire Limited, Western Industrial Estate, Caerphilly, CF83 1NA, United Kingdom. email:info@nuaire.co.uk
UK Commercial Enquiries T:029 2085 8200 UK Residential Enquiries T:029 2085 8500 International Enquiries T:+44.29 2085 8497

Whilst the information given on this data sheet is fan specific, it is in summary and reference to the product selection catalogue and installation & maintenance documents is recommended.
This data sheet produced on 07 May 2021 13:04 using software version 3.6.19.2088 - 12-Mar-2018

Technical Data

Genie-DCE - Decentralised Mechanical Extract Fan
Decentralised Mechanical Extract Fan

Fan Code:	**GENIE-DCE-H**
Installation Manual Links:	671504
Required Duty:	15 l/s @ 0 Pa
Actual Duty:	31 l/s @ 0 Pa
Actual at Required Flow:	15 l/s @ 72 Pa
Velocity at Actual Duty:	m/s
When Speed Controlled to Required Duty (48.4%):	
Velocity at Required Duty:	m/s
Motor Input Power:	**0.001 kW**
Specific Fan Power:	**0.1 W/(l/s)**
Motor Efficiency:	0 %
Maximum Fan Input Power:	0.012 kW
Motor Input Power:	0.013 kW
Specific Fan Power:	0.4 W/(l/s)
Nominal Fan Speed:	2 Pole 2,300 RPM
Electrical Supply:	230 V 1 Phase 50 Hz
Motor Rating:	0.012 kW
Motor Current:	flc: 0.014 A
Motor Current:	sc: 0.014 A
Max. Operating Temp.:	40°C
Weight:	1 kg

Sound Data

Acoustic perfomance to ISO 13347 and AMCA 300.

Sound Power Levels re 1 pWatts (Hz):

	63	125	250	500	1k	2k	4k	8k	dBA
Induct Inlet	47	44	42	38	32	28	22	17	22

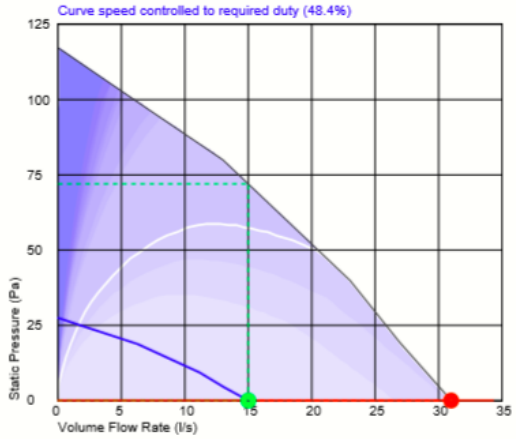
The above spectrums running speed controlled to required duty (48.4%). When running at full speed:

Induct Inlet	51	50	50	49	48	44	38	33	34

dBA is hemi-spherical at 3 metres. For spherical deduct 3 dBA.

Please note that the noise data stated on this data sheet for the unit and/or silencer is tested in accordance with UK, European and International industry laboratory standards. However onsite conditions may vary and we would recommend that this information is verified by an acoustic specialist in order to ensure its suitability for the intended application.

Performance Curve



Specification

Unit shall be SAP Appendix Q eligible.

Under wind load conditions the unit will be capable of maintaining it's set flowrate to within 5%.

The unit shall be surface mountable incorporating a push fit, washable filter with an area of 23,750mm² and capable of conversion, if necessary, to semi-recessed format using flange supplied or window mounting format using optional fixing kit.

Unit noise level shall not exceed 20dBA @3m for kitchens and 16dBA for wet rooms (normal running).

The unit shall incorporate an injection moulded forward curved centrifugal impeller.

The impeller shall be directly driven by a low energy, high efficiency 12V DC motor, fitted with sealed, self lubricating ball bearings.

Motors shall have locked rotor protection to prevent overheating in the event of fan failure.

The fan/motor assembly and the unit control assembly shall be capable of replacement as "plug in" modules without disturbing the field wiring.

Each unit is capable of being set to comply with new edition (2010) Part F - ventilation building regulations for (System 3) continuous mechanical extract (MEV) and new edition (2010) Part L - conservation of fuel and power.

Units shall be fitted with a run-on timer facility (1-60 minutes), from switched live signal only.

Fan status indication to be visible on front of unit, with flashing LED to show fan failure.

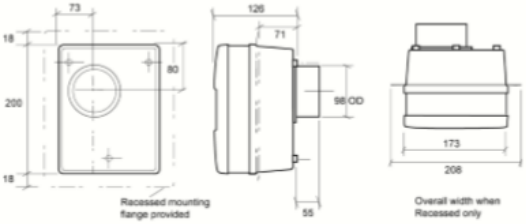
Plastic casing to be manufactured from flame retardant materials.

The unit shall be designed for quietest operation to ensure occupant satisfaction.

The unit shall incorporate electrical connections to allow for the unit's "boost" airflow to be triggered by either pull-cord or switched live.

The unit shall be supplied with a 5 year warranty. .

Fan Dimensions



The drawing is for dimensional purposes only. Dimensions in mm.

Figure D.3 – No 22 Extractor Fan

nuaire SUMMARY FAN DATA SHEET

Nuaire Limited, Western Industrial Estate, Caerphilly, CF83 1NA, United Kingdom. email:info@nuaire.co.uk
UK Commercial Enquiries T:029 2085 8200 UK Residential Enquiries T:029 2085 8500 International Enquiries T:+44.29 2085 8497

Whilst the information given on this data sheet is fan specific, it is in summary and reference to the product selection catalogue and installation & maintenance documents is recommended.
This data sheet produced on 07 May 2021 13:09 using software version 3.6.19.2088 - 12-Mar-2018

Technical Data

DE - DAVE Extract Fan with Ecosmart Control
Inline Centrifugal Extract Fan

Fan Code:	**DE6-ES**
Installation Manual Links:	611280
Required Duty:	175 l/s @ 150 Pa
Actual Duty:	328 l/s @ 527 Pa
Actual at Required Flow:	175 l/s @ 607 Pa
Velocity at Actual Duty:	2.611 m/s
When Speed Controlled to Required Duty (53.3%):	
Velocity at Required Duty:	1.393 m/s
Motor Input Power:	**0.082 kW**
Specific Fan Power:	**0.5 W/(l/s)**
Motor Efficiency:	0 %
Motor Input Power:	0.537 kW
Specific Fan Power:	1.6 W/(l/s)
Nominal Fan Speed:	1,710 RPM
Electrical Supply:	230 V 1 Phase 50 Hz
Motor Rating:	0.45 kW
Motor Current:	flc: 2.9 A
Motor Current:	sc: 2.9 A
Max. Operating Temp.:	40°C

Acoustic perfomance to ISO 13347 and AMCA 300.

Sound Power Levels re 1 pWatts (Hz):

	63	125	250	500	1k	2k	4k	8k	dBA
Induct Inlet	87	83	69	58	53	49	47	40	
Induct Outlet	87	83	69	58	53	48	44	37	
Breakout	71	63	60	43	40	29	24	18	36

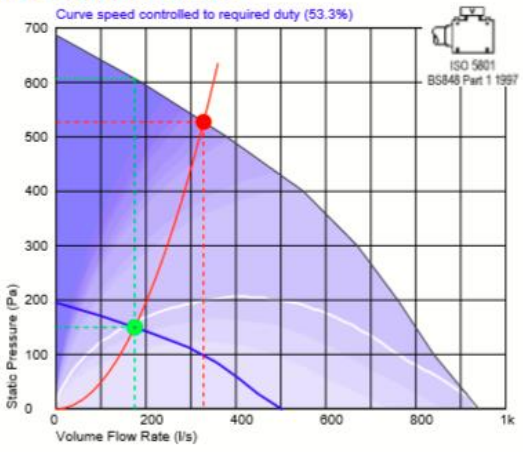
The above spectrums running speed controlled to required duty (53.3%). When running at full speed:

Induct Inlet	91	88	76	68	67	63	61	54	
Induct Outlet	91	88	76	68	67	62	58	51	
Breakout	75	68	67	53	54	43	38	32	43

dBA is hemi-spherical at 3 metres. For spherical deduct 3 dBA.
Values shown are for inlet Lw, outlet Lw sound power & breakout levels for: Installation Type D: ducted inlet, ducted outlet. Ratings include the effects of duct end correction.

Please note that the noise data stated on this data sheet for the unit and/or silencer is tested in accordance with UK, European and International industry laboratory standards. However onsite conditions may vary and we would recommend that this information is verified by an acoustic specialist in order to ensure its suitability for the intended application.

Performance Curve



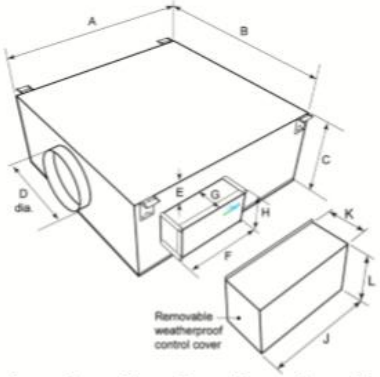
Specification

Dave high performance extract fan, standard case with patented 'Floating fan' construction. Single skin, with infill panels and manufactured from heavy gauge, corrosion resistant Aluzinc steel. The unit is suitable for internal or external mounting, in any orientation and incorporates a full length top or bottom access panel. The fan impeller and EC motors are selected to provide optimum performance and energy efficiency conforming to Part L regulations. Units are suitable for operation in ambient temperatures of up to 60°C (sizes 1-5), 40°C (sizes 6-7) and are Class L2 leakage. The unit shall be controlled by an integrated Ecosmart control mounted externally to the case. The fans shall have the following energy saving and operational functions integrally installed with in it, all components will be pre-wired and fitted by the manufacturer:

- Integral Frequency inverter/speed controller.
- Integral adjustable run-on timer.
- Maximum and minimum speed adjustment/setting (trickle and boost).
- Volt free run & failure/status indication.
- 0-10V BMS interface for remote operation.
- Multiple low voltage sockets for interconnection of sensors or fans.
- Background ventilation/trickle enable switch.

The unit is supplied with circular spigots and set of four mounting brackets. The Fan unit shall have a 5 year warranty. .

Fan Dimensions



A	B	C	D	E	F	G	H	J
605	1,100	465	400	162	370	96	150	470

K	L	kg
120	170	69

The drawing is for dimensional purposes only. Dimensions in mm.

Figure D.4 - No 20 Tea Point Extract Fan

nuaire SUMMARY FAN DATA SHEET

Nuaire Limited, Western Industrial Estate, Caerphilly, CF83 1NA, United Kingdom. email:info@nuaire.co.uk
UK Commercial Enquiries T:029 2085 8200 UK Residential Enquiries T:029 2085 8500 International Enquiries T:+44.29 2085 8497

Whilst the information given on this data sheet is fan specific, it is in summary and reference to the product selection catalogue and installation & maintenance documents is recommended.
This data sheet produced on 07 May 2021 13:06 using software version 3.6.19.2088 - 12-Mar-2018

Technical Data

Genie-DCE - Decentralised Mechanical Extract Fan
Decentralised Mechanical Extract Fan

Fan Code:	**GENIE-DCE-H**
Installation Manual Links:	671504
Required Duty:	15 l/s @ 25 Pa
Actual Duty:	21 l/s @ 48 Pa
Actual at Required Flow:	15 l/s @ 72 Pa
Velocity at Actual Duty:	m/s
When Speed Controlled to Required Duty (71.8%):	
Velocity at Required Duty:	m/s
Motor Input Power:	**0.004 kW**
Specific Fan Power:	**0.3 W/(l/s)**
Motor Efficiency:	0 %
Maximum Fan Input Power:	0.012 kW
Motor Input Power:	0.01 kW
Specific Fan Power:	0.5 W/(l/s)
Nominal Fan Speed:	2 Pole 2,300 RPM
Electrical Supply:	230 V 1 Phase 50 Hz
Motor Rating:	0.012 kW
Motor Current:	flc: 0.014 A
Motor Current:	sc: 0.014 A
Max. Operating Temp.:	40°C
Weight:	1 kg

Sound Data

Acoustic perfomance to ISO 13347 and AMCA 300.

Sound Power Levels re 1 pWatts (Hz):

	63	125	250	500	1k	2k	4k	8k	dBA
Induct Inlet	49	47	46	44	40	36	30	25	28

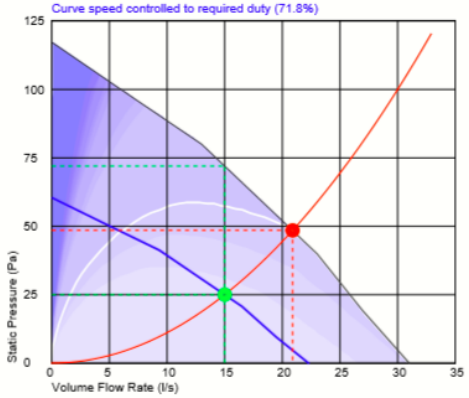
The above spectrums running speed controlled to required duty (71.8%). When running at full speed:

Induct Inlet	51	50	50	49	48	44	38	33	34

dBA is hemi-spherical at 3 metres. For spherical deduct 3 dBA.

Please note that the noise data stated on this data sheet for the unit and/or silencer is tested in accordance with UK, European and International industry laboratory standards. However onsite conditions may vary and we would recommend that this information is verified by an acoustic specialist in order to ensure its suitability for the intended application.

Performance Curve



Specification

Unit shall be SAP Appendix Q eligible.

Under wind load conditions the unit will be capable of maintaining it's set flowrate to within 5%.

The unit shall be surface mountable incorporating a push fit, washable filter with an area of 23,750mm² and capable of conversion, if necessary, to semi-recessed format using flange supplied or window mounting format using optional fixing kit.

Unit noise level shall not exceed 20dBA @3m for kitchens and 16dBA for wet rooms (normal running).

The unit shall incorporate an injection moulded forward curved centrifugal impeller.

The impeller shall be directly driven by a low energy, high efficiency 12V DC motor, fitted with sealed, self lubricating ball bearings.

Motors shall have locked rotor protection to prevent overheating in the event of fan failure.

The fan/motor assembly and the unit control assembly shall be capable of replacement as "plug in" modules without disturbing the field wiring.

Each unit is capable of being set to comply with new edition (2010) Part F - ventilation building regulations for (System 3) continuous mechanical extract (MEV) and new edition (2010) Part L - conservation of fuel and power.

Units shall be fitted with a run-on timer facility (1-60 minutes), from switched live signal only.

Fan status indication to be visible on front of unit, with flashing LED to show fan failure.

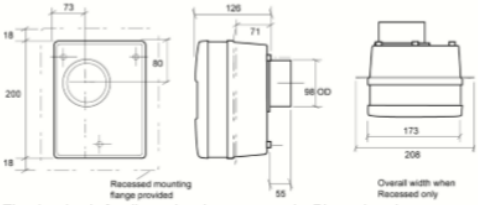
Plastic casing to be manufactured from flame retardant materials.

The unit shall be designed for quietest operation to ensure occupant satisfaction.

The unit shall incorporate electrical connections to allow for the unit's "boost" airflow to be triggered by either pull-cord or switched live.

The unit shall be supplied with a 5 year warranty. .

Fan Dimensions



The drawing is for dimensional purposes only. Dimensions in mm.

Figure D.5 - No 46 Lower Ground Shower and WC Extraction Fan

nuaire SUMMARY FAN DATA SHEET

Nuaire Limited, Western Industrial Estate, Caerphilly, CF83 1NA, United Kingdom. email:info@nuaire.co.uk
UK Commercial Enquiries T:029 2085 8200 UK Residential Enquiries T:029 2085 8500 International Enquiries T:+44.29 2085 8497

Whilst the information given on this data sheet is fan specific, it is in summary and reference to the product selection catalogue and installation & maintenance documents is recommended.
This data sheet produced on 07 May 2021 13:08 using software version 3.6.19.2088 - 12-Mar-2018

Technical Data

DE - DAVE Extract Fan with Ecosmart Control
Inline Centrifugal Extract Fan

Fan Code:	**DE1-ES**
Installation Manual Links:	611280
Required Duty:	21 l/s @ 100 Pa
Actual Duty:	34 l/s @ 256 Pa
Actual at Required Flow:	21 l/s @ 312 Pa
Velocity at Actual Duty:	1.902 m/s
When Speed Controlled to Required Duty (62.4%):	
Velocity at Required Duty:	1.188 m/s
Motor Input Power:	**0.009 kW**
Specific Fan Power:	**0.4 W/(l/s)**
Motor Efficiency:	0 %
Motor Input Power:	0.035 kW
Specific Fan Power:	1 W/(l/s)
Nominal Fan Speed:	3,770 RPM
Electrical Supply:	230 V 1 Phase 50 Hz
Motor Rating:	0.03 kW
Motor Current:	flc: 0.27 A
Motor Current:	sc: 0.27 A
Max. Operating Temp.:	60°C

Acoustic perfomance to ISO 13347 and AMCA 300.

Sound Power Levels re 1 pWatts (Hz):

	63	125	250	500	1k	2k	4k	8k	dBA
Induct Inlet	68	57	57	46	40	35	34	32	
Induct Outlet	70	61	61	54	44	39	39	32	
Breakout	49	48	39	35	19	17	<16		19

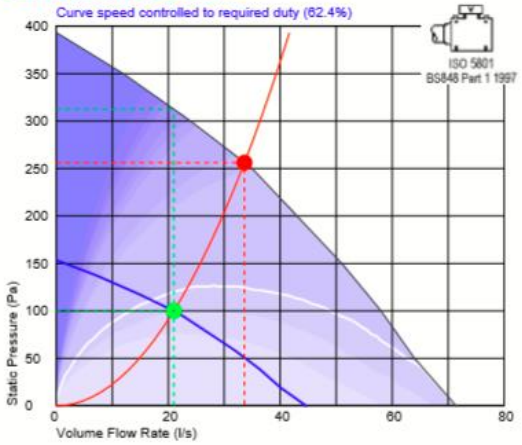
The above spectrums running speed controlled to required duty (62.5%). When running at full speed:

Induct Inlet	71	61	63	53	51	46	45	43	
Induct Outlet	73	65	67	61	55	50	50	43	
Breakout	52	52	45	42	30	28	25	<16	25

dBA is hemi-spherical at 3 metres. For spherical deduct 3 dBA.
Values shown are for inlet Lw, outlet Lw sound power & breakout levels for: Installation Type D: ducted inlet, ducted outlet. Ratings include the effects of duct end correction.

Please note that the noise data stated on this data sheet for the unit and/or silencer is tested in accordance with UK, European and International industry laboratory standards. However onsite conditions may vary and we would recommend that this information is verified by an acoustic specialist in order to ensure its suitability for the intended application.

Performance Curve



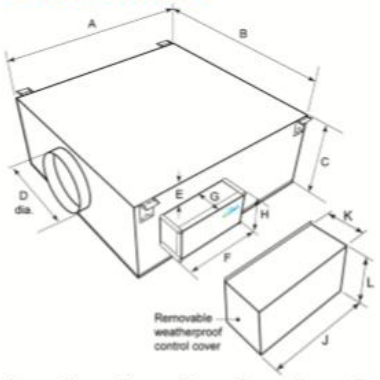
Specification

Dave high performance extract fan, standard case with patented 'Floating fan' construction. Single skin, with infill panels and manufactured from heavy gauge, corrosion resistant Aluzinc steel. The unit is suitable for internal or external mounting, in any orientation and incorporates a full length top or bottom access panel. The fan impeller and EC motors are selected to provide optimum performance and energy efficiency conforming to Part L regulations. Units are suitable for operation in ambient temperatures of up to 60°C (sizes 1-5), 40°C (sizes 6-7) and are Class L2 leakage. The unit shall be controlled by an integrated Ecosmart control mounted externally to the case. The fans shall have the following energy saving and operational functions integrally installed with in it, all components will be pre-wired and fitted by the manufacturer:

- Integral Frequency inverter/speed controller.
- Integral adjustable run-on timer.
- Maximum and minimum speed adjustment/setting (trickle and boost).
- Volt free run & failure/status indication.
- 0-10V BMS interface for remote operation.
- Multiple low voltage sockets for interconnection of sensors or fans.
- Background ventilation/trickle enable switch.

The unit is supplied with circular spigots and set of four mounting brackets. The Fan unit shall have a 5 year warranty. .

Fan Dimensions

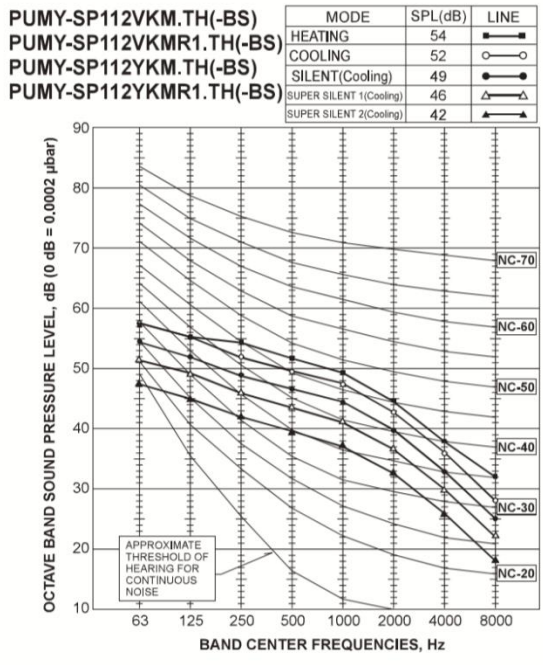


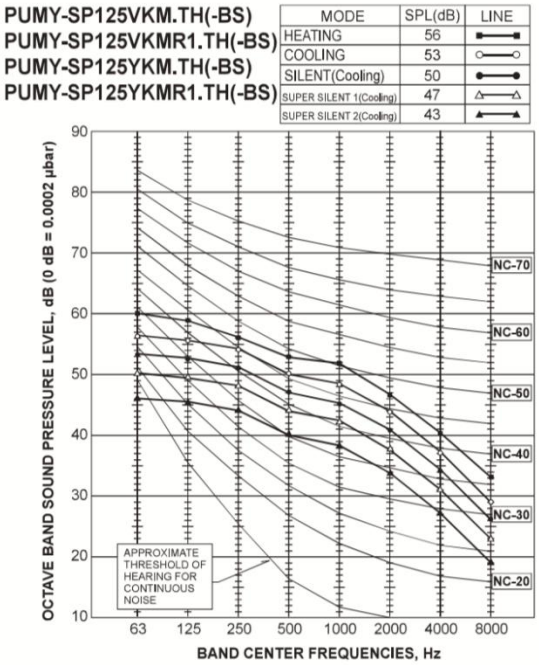
A	B	C	D	E	F	G	H	J
605	567	243	150	51	370	96	150	470

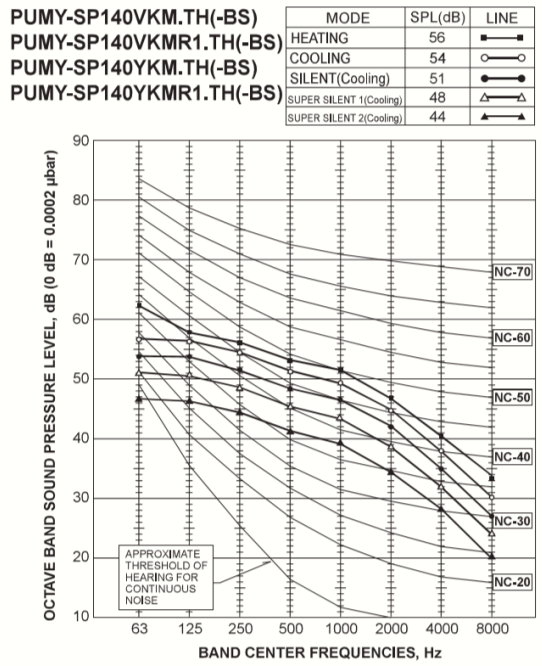
K	L	kg
120	170	25

The drawing is for dimensional purposes only. Dimensions in mm.

Figure D.6 - Condensers







Appendix E. Measurement Data and Weather Data

Figure E.1 - Wind Speed and Precipitation Values for the period 10/05/21 - 17/05/21

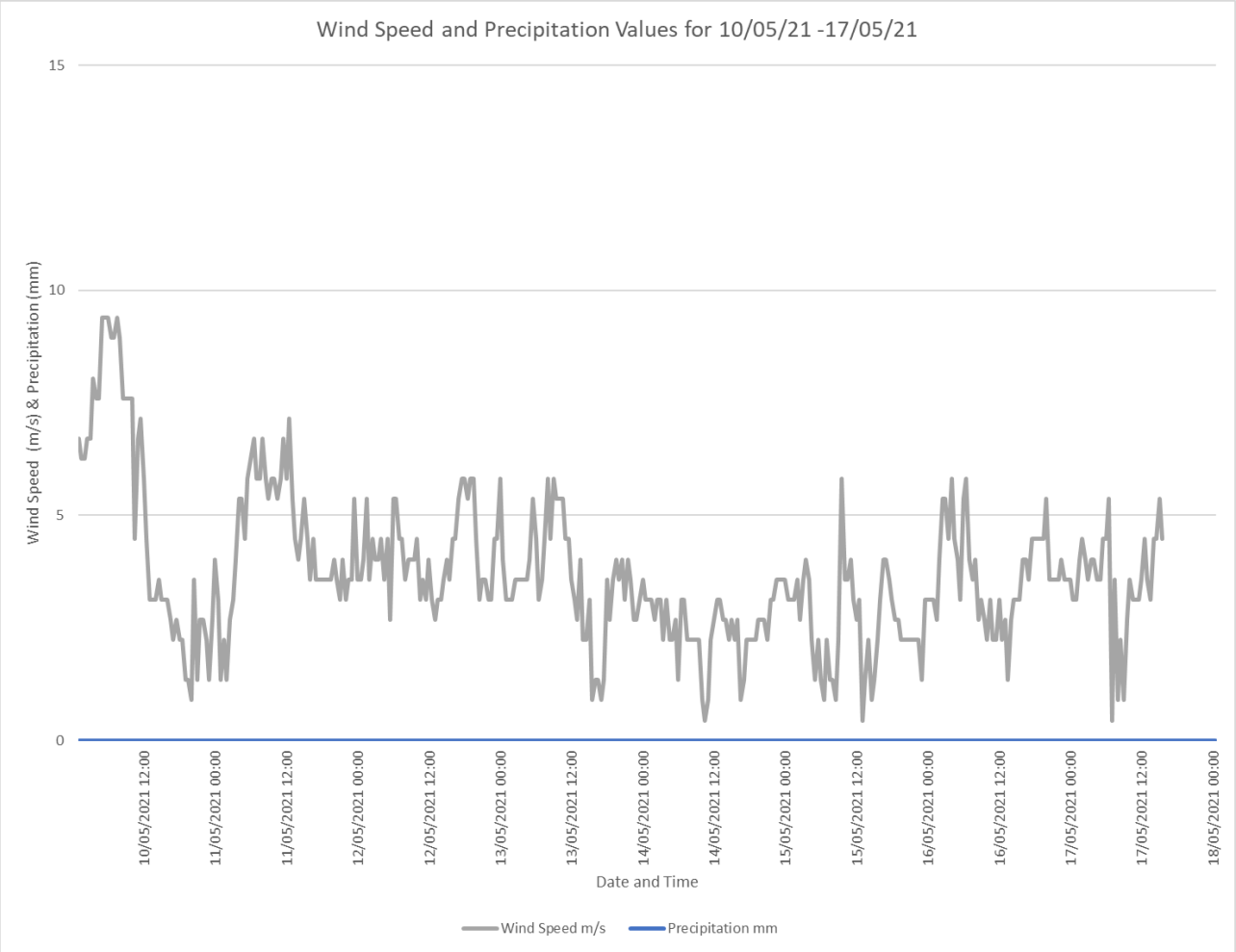


Figure E.2 - L_{90} Values for the period 10/05/21 - 17/05/21

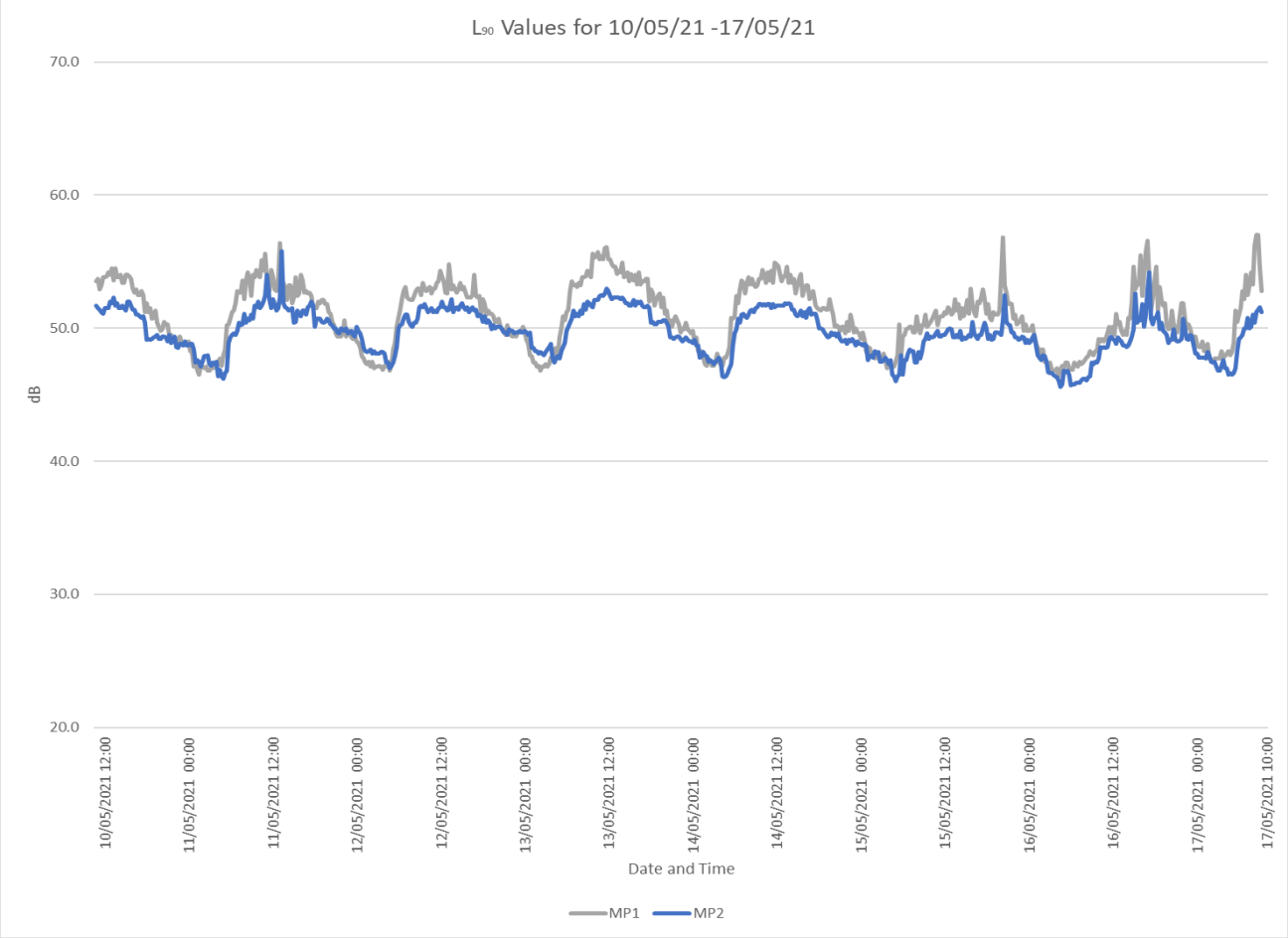
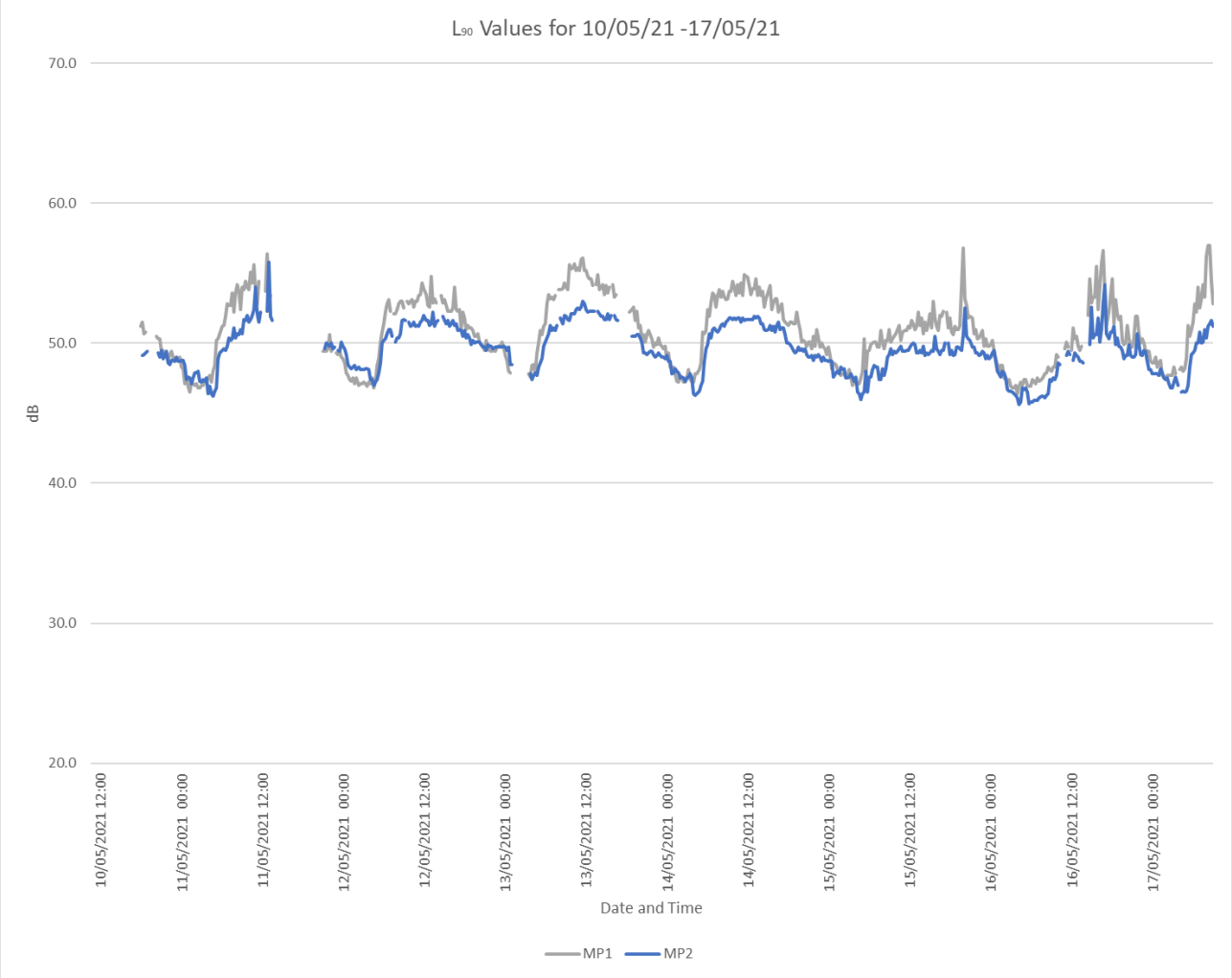


Figure E.3 - L_{90} Values for the period 10/05/21 - 17/05/21 with data removed when wind speed > 5m/s



Appendix F. $L_{A90,\ 15mins}$ Statistical Analysis

Figure F.1 - Statistical analysis of the daytime (07:00-23:00) L_{A90} measurements to determine background sound level at MP1.

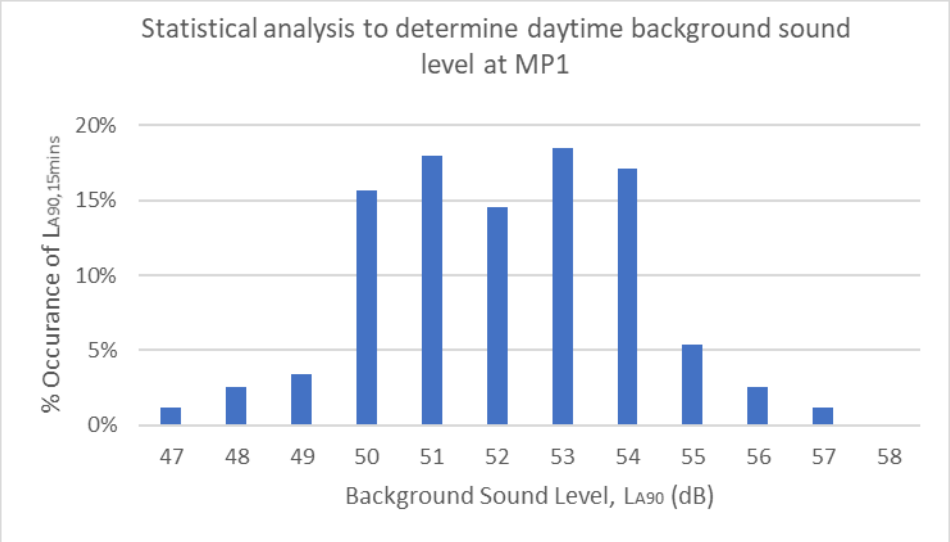


Figure F.2 - Statistical analysis of the night-time (23:00-07:00) L_{A90} measurements to determine background sound level at MP1.

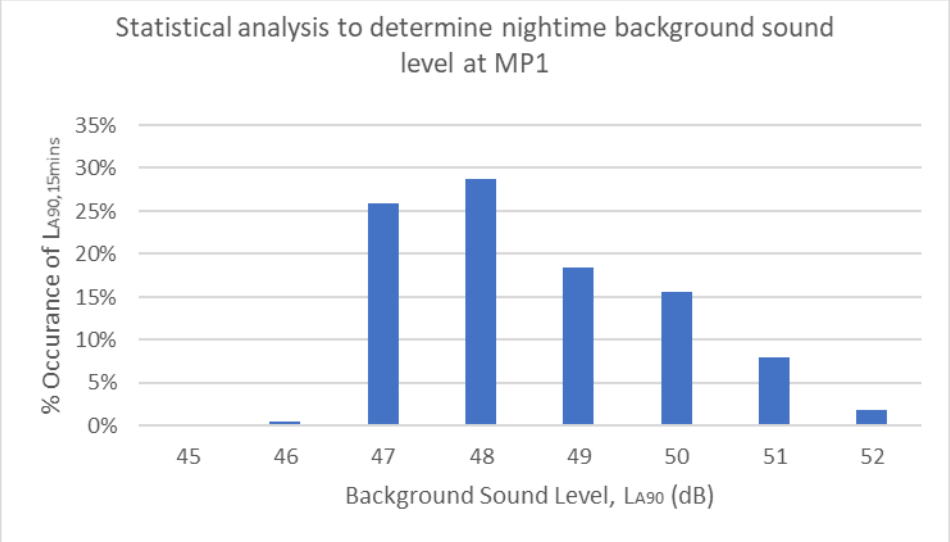


Figure F.3 - Statistical analysis of the daytime (07:00-23:00) L_{A90} measurements to determine background sound level at MP2.

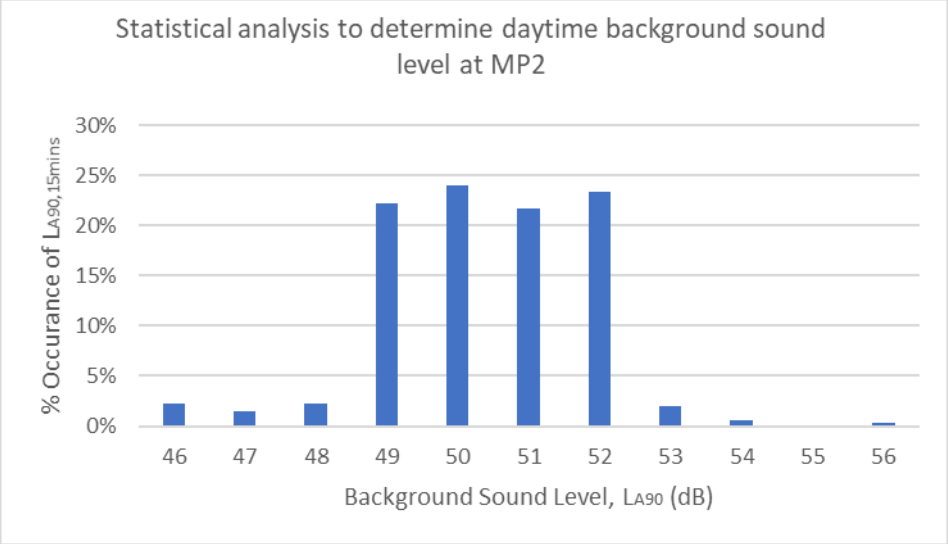
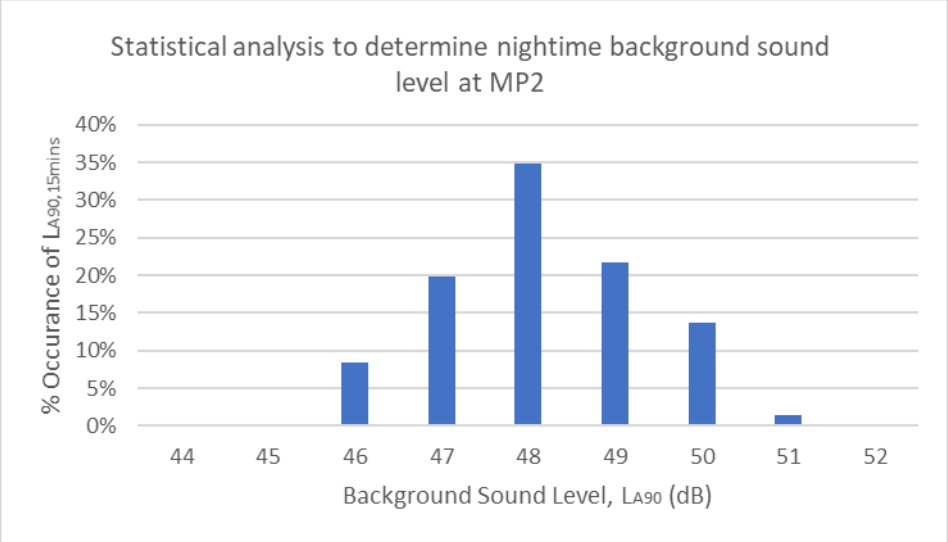
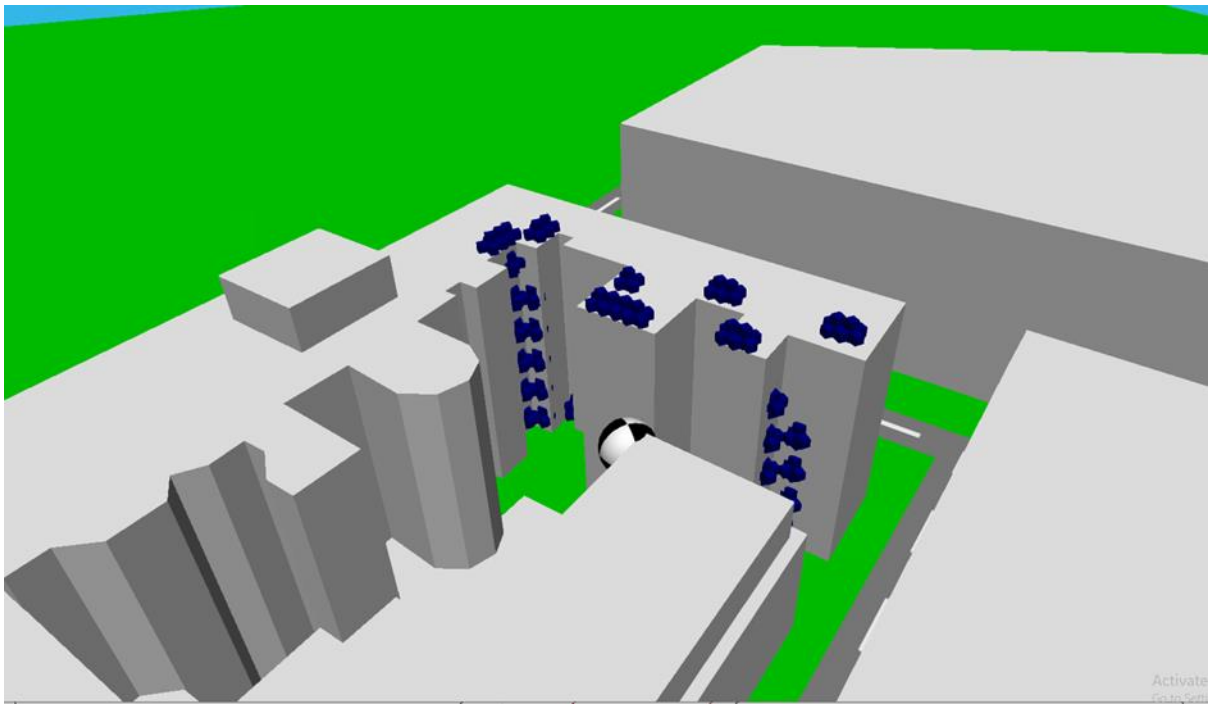


Figure F.4 - Statistical analysis of the night-time (23:00-07:00) L_{A90} measurements to determine background sound level at MP2.



Appendix G. CadnaA Model

Figure G.1 - CadnaA Model Screenshot

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