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Project:

75 Hillway

Title:

Plant Noise Impact Assessment

quietly moving forward

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Revision	Date	Author	Checked
0	22/04/25	Robert Murray	Jon Mudd

CONTENTS:

1 INTRODUCTION

1.01 Environmental Equipment Corporation Limited has been commissioned by Thurgood Design Ltd (TDL) to undertake a noise assessment of a single heat pump unit, and two MVHR systems to serve 75 Hillway.

1.02 This noise assessment has been conducted in accordance with the policies and requirements of the London Borough of Camden (LBC) and is based on a noise survey carried out at the site over a typical weekday period.

1.03 This assessment includes:

- the setting of plant noise limits in accordance with the requirements of LBC and national planning policy, standards and guidance; and
- the prediction of noise impacts at the worst affected noise sensitive receptors based on the proposed items of plant and their location.

1.04 This report is prepared solely for Thurgood Design Ltd (TDL). Environmental Equipment Corporation Limited accepts no responsibility for its use by any third party. Note that the contents contained herein are produced for the purposes of review by relevant Planning Authority departments and do not constitute a detailed design or specification document to be used for the purposes of construction. Subsequent development of noise mitigation schemes shall engage EEC Ltd and Thurgood Design Ltd (TDL) so as to support the conclusions of this report.

1.05 Whilst every effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in Appendix A.

2 SITE

2.01 75 Hillway is a two-storey dwelling located in a predominantly residential area of Highgate.

2.02 The property is bound by the following:

- North – No. 77 Hillway;
- East – Adjacent properties across Hillway Street;
- South – No. 79 Hillway; and
- West – Amenity spaces of neighbouring properties.

2.03 This application is for new proposed mechanical services plant which are shown in Table 2.1 below, locations also presented in Appendix B.

Plant Item	Location	Closest Noise Sensitive Receptor
ACOND GRANDIS R heat pump	Front driveway next to northern side elevation of 75 Hillway	Front bedroom window of No. 77 Hillway
Zehnder ComfoAir Q350 MVHR	Intake/exhaust terminations on northern side elevation of 75 Hillway (towards north-western side)	Front bedroom window of No. 77 Hillway

Zehnder ComfoAir Q450 MVHR	Intake/exhaust terminations on roof pitch of 75 Hillway (towards north-western side)	Guest bedroom window of No. 77 Hillway

Table 2.1: Proposed Mechanical Services Plant and Respective Locations

2.04 It is proposed that attenuators will be installed within the atmosphere side ductwork of the MVHR systems (though concealed within the building fabric as to not be externally visible) to ensure the proposed acoustic design criteria are achieved.

2.05 The closest noise sensitive receptors to the proposed plant items are the following, these have all been identified in the site plan imagery in Appendix B:

- First floor bedroom window on front elevation of No. 77 Hillway; and
- First floor guest bedroom window on southern side elevation of No.77 Hillway

2.06 All other noise sensitive receptors are at a greater distance from the proposed location of the plant items or are protected by more screening by the intervening structures, and as such will be subject to lower levels of noise.

3 GUIDANCE

3.01 Local and National Planning Policy for London Borough of Camden (LBC) is presented in Appendix C of this document.

Local Planning Policy & NPPF

3.02 LBC's Local Plan outlines a framework within which the Authority assesses the acceptability of mechanical services noise as it affects existing residential amenity. Proposals are categorised using a traffic light system as follows:

- **Green** (LOAEL) Where noise is considered to be at an acceptable level (plant noise is -10dB with respect to the background noise level).
- **Amber** (LOAEL-SOAEL) A range over which the impact of the noise could be considered adverse to varying degrees though maybe acceptable when considered in context (plant noise ranges between -9dB to +5dB with respect to the background noise level).
- **Red** (SOAEL) Where noise is observed to have a significant adverse effect (plant noise is greater than 5dB above the background noise level)

3.03 Plant noise levels are generally assessed in accordance with the guidance and methodology specified within *BS4142:2014: 'Methods for rating and assessing industrial and commercial sound'*.

3.04 It is noted that where the rating level for plant noise is 10 dB or more below the background noise, this would typically be considered as the NOEL (no observed effect level) rather than LOAEL (lowest observed adverse effect level) referenced by LBC. In the context of the background noise the LOAEL is commonly adopted as the point at which the introduction of a new noise would lead to a background increase greater than 1 dB, however such incremental changes are not generally perceptible in the general population so the impact of such a change would be considered to be 'minor' in the short term and 'negligible' in the long term.

4 MEASUREMENTS

4.01 Environmental noise measurements were carried out over a weekday period, between 12:50 hours on Wednesday 7th August 2024 and concluded 13:20 hours the following day, to establish the existing noise levels at the site. The survey methodology and results are set out below.

4.02 Noise measurements have been carried out at the following position, as shown in Appendix B and described as:

- Position 1: located at a height of approximately 1.5 metres above the top of the ground. The measurement was not located within 3.5 metres of any reflecting surfaces, other than the mounting surface.

4.03 This position is considered to be representative of the nearest windows to the proposed heat pump and MVHR system terminations.

5 EQUIPMENT

5.01 The equipment used for the survey was as follows:-

- 01dB Fusion Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
- GRAS 40CD Condenser Microphone, PRE22 S Pre-amp and Connecting Leads;
- Tripod.

5.02 The equipment holds current UKAS or equivalent accreditation and serial numbers as follows:

Sound Level Meter 01dB Fusion	Serial No.	12241
	Calibration Date	21st May 2024
	Cal Certificate No.	U47874
½" Condenser Mic. GRAS 40CD	Serial No.	330667
	Calibration Date	21st May 2024
	Cal Certificate No.	47873
Calibrator CAL 31	Serial No.	89090
	Calibration Date	3rd May 2024
	Cal. Certificate No.	U47718

N.B. Copies of calibration certificates are available upon request.

5.03 The equipment was calibrated both before and after the survey with no difference noted in the levels.

6 RESULTS

6.01 The weather during the survey was suitable for noise measurement, it being dry with little wind for the duration of the survey.

6.02 Noise sources at the site include local and distant road traffic. There were no other significant sources of noise during the survey.

6.03 A list of the levels measured is included in Appendix D and represented graphically in Appendix E.

6.04 A summary of the time averaged ambient levels and lowest measured background levels over the measurement periods are shown in Table 6.1. The minimum L_{A90} is the lowest fifteen minute measurement in the specified period.

Position	Period	Average $L_{Aeq,T}$ – dB	Minimum L_{A90} – dB
1	Day time (0700-1900 hrs)	53	33
	Evening (1900-2300 hrs)	47	29
	Night-time (2300-0700 hrs)	39	27

Table 6.1: Free-Field Measured Ambient and Lowest Background Noise Levels

7 PLANT ASSESSMENT

7.01 This application is for the installation of a single heat pump unit and two MVHR systems.

7.02 Based on the standard requirements of the London Borough of Camden (LBC) and the lowest measured background noise level in each time period, Table 7.1 sets out the recommended noise limits that the proposed items of plant should meet.

7.03 In accordance with the requirements of LBC, and with the aim of meeting the Green target, the proposed noise limits are based on being 10 dB below the measured background noise level.

Location	Period	Measured Existing $L_{A90,T}$	Proposed Noise Limit L_{Ar}
1	Day	33 dB	23 dB
	Evening	29 dB	19 dB
	Night	27 dB	17 dB

Table 7.1: Suggested Plant Noise Emission Limits Based on Lowest Measured L_{A90}, Free-field dB

7.04 Note that the limits suggested above are rating levels and as such any design should take into account the acoustic characteristics of the plant. In this instance the proposed units display none of the characteristics whereby the acoustic correction should be applied.

7.05 Assuming the proposed items meet the noise limits set out in Table 7.1 noise will be below the NOEL with respect to the NPPF.

7.06 The proposed plant items have stated manufacturers sound power levels as shown in Table 7.2 below. Copies of the manufacturer's plant data sheets are included in Appendix F.

Plant Item	Manufacturer-Stated Sound Power Level
ACOND GRANDIS R heat pump	48 dB(A)
Zehnder ComfoAir Q350 intake	54 dB(A)
Zehnder ComfoAir Q350 exhaust	70 dB(A)
Zehnder ComfoAir Q450 intake	56 dB(A)
Zehnder ComfoAir Q450 exhaust	71 dB(A)

Table 7.2: Manufacturer Stated Noise Levels for Proposed Items of Plant

7.07 It is proposed that the atmosphere side ductwork of the MVHR systems will incorporate duct mounted attenuators.

7.08 To mitigate structure borne noise, it is proposed that the heat pump be installed on suitable anti vibration mounts.

7.09 Predicted noise levels have been calculated at the closest noise sensitive windows, the front bedroom window and guest bedroom window of No. 77 Hillway.

7.10 Other residential receptors located further from the site will be subject to lower noise levels than those predicted at the above locations.

7.11 Tables 7.3-7.6 present the results of worst-case plant noise predictions at the worst-case locations.

Item	Noise Level	Notes
ACOND GRANDIS R	48 dB(A)	Sound Power Level
Reflections	+ 3 dB	Additional reflections – side wall of 75 Hillway to rear of heat pump
Barrier Effect	- 5 dB	Screening from side wall of No. 77 Hillway
Conformal area Losses over 9.5 metres	- 31 dB	Distance to closest window
Resultant Noise Level	15 dB(A)	Front bedroom window of No. 77 Hillway

Table 7.3: No. 77 Hillway front bedroom window - Heat Pump Noise Calculation

Item	Noise Level		Notes
	Intake	Exhaust	
Zehnder ComfoAir Q350	54 dB(A)	70 dB(A)	Sound Power Level
Noise Control	- 13 dB	- 26 dB	In-duct acoustic attenuators for intake and exhaust ductwork
Directivity	- 4 dB	- 4 dB	Receptor off-axis from terminations
Reflections	+ 3 dB		Additional reflections – side wall of 75 Hillway to rear of terminations
Barrier Effect	- 5 dB		Screening from side wall of No. 77 Hillway
Spherical area Losses over 10 metres	- 31 dB		Distance to closest window
Resultant Noise Level	4 dB(A)	7 dB(A)	Front bedroom window of No. 77 Hillway
Cumulative Resultant Noise Level	9 dB(A)		Front bedroom window of No. 77 Hillway

Table 7.4: No. 77 Hillway front bedroom window - MVHR Noise Calculation

Item	Noise Level		Notes
	Intake	Exhaust	
Zehnder ComfoAir Q450	56 dB(A)	71 dB(A)	Sound Power Level
Noise Control	- 13 dB	- 26 dB	In-duct acoustic attenuators for intake and exhaust ductwork
Directivity	- 8 dB	- 8 dB	Receptor off-axis from terminations
Reflections	+ 3 dB		Additional reflections – roof of 75 Hillway to rear of terminations
Spherical area Losses over 6 metres	- 27 dB		Distance to closest window
Resultant Noise Level	11 dB(A)	13 dB(A)	Guest bedroom window of No. 77 Hillway
Cumulative Resultant Noise Level	15 dB(A)		Guest bedroom window of No. 77 Hillway

Table 7.5: No. 77 Hillway guest bedroom window - MVHR Noise Calculation

Property	Period	Proposed Noise Limit L_{Ar}	Predicted $L_{Aeq,T}$	Exceedance of noise limit
Front Bedroom Window of 77 Hillway	Daytime	23 dB	16 dB*	- 7 dB
	Evening	19 dB	16 dB*	- 3 dB
	Night-time	17 dB	16 dB*	- 1 dB
Guest Bedroom Window of 77 Hillway	Daytime	23 dB	15 dB	- 8 dB
	Evening	19 dB	15 dB	- 4 dB
	Night-time	17 dB	15 dB	- 2 dB
**Cumulative noise level from heat pump and MVHR*				

Table 7.6: Assessment of Predicted Noise Levels Based on Proposed Noise Limit, Free-field dB(A)

7.12 With the atmosphere side ductwork of the MVHR systems installed with acoustic attenuators, predicted noise levels will meet the requirements of the Local Authority during all periods of operation and at the closest noise sensitive receptors.

7.13 The proposed scheme of vibration isolation will also mitigate the transfer of vibration to the supporting and connecting structures.

7.14 With respect to the NPPF, achieving the noise limits would be classified as being below the NOEL.

8 CONCLUSIONS

8.01 Thurgood Design Ltd (TDL) has appointed Environmental Equipment Corporation Limited to undertake a noise assessment for a proposed heat pump unit, and two MVHR systems to serve 75 Hillway.

8.02 The assessment has been carried out in accordance with national planning guidance and the requirements of the London Borough of Camden (LBC), and is based on an environmental noise survey conducted at the site over a mid-week period.

8.03 A noise assessment has been undertaken to evaluate the potential noise impact of the proposed plant at the closest existing residential receptors.

8.04 Plant noise limits have been set based on the methodology contained in BS4142, the results of a background noise survey and the requirements of LBC, to control the noise from the proposed plant items. In accordance with LBC, the noise limit has been set 10 dB below the lowest measured background noise level, to meet LBC's Green target.

8.05 Predictions have shown that the noise criterion is met at all assessment locations during all periods of the plants' proposed operation, based on the atmosphere side ductwork of the MVHR systems including the specified level of attenuation.

8.06 Assessing the site in accordance with the principles of the National Planning Policy Framework has shown that predicted noise levels would be below the level at which no effects are observed to occur, the NOEL.

8.07 On the basis of this assessment it is considered that noise does not pose a material constraint to the operation of the heat pump unit and MVHR systems.

APPENDIX A

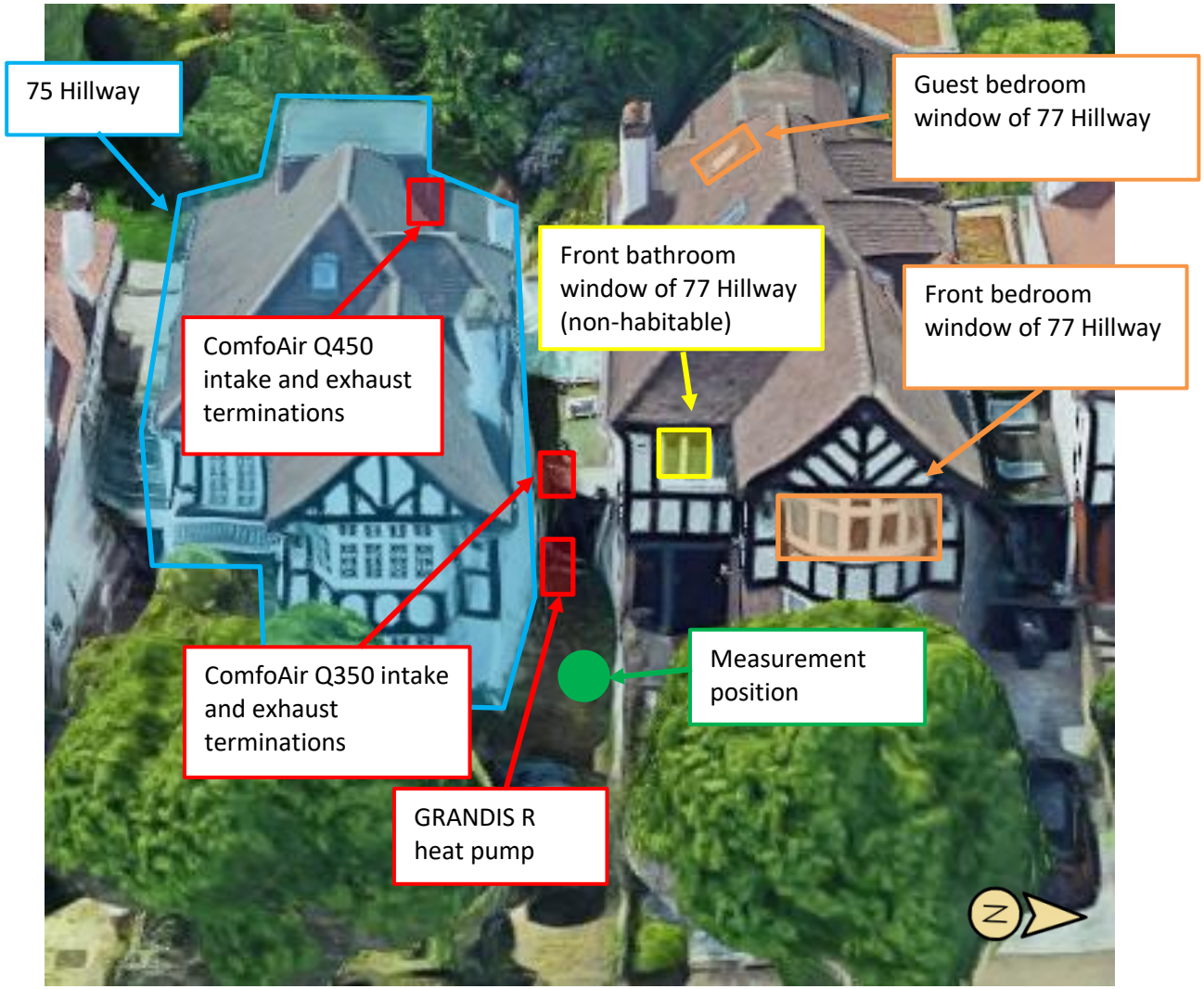
GLOSSARY OF TECHNICAL TERMS

ACOUSTIC TERMINOLOGY

Absorption Classes	The sound absorption of a material is rated from Class A to Class E, where Class A materials provide the highest level of sound absorption.
Ambient Noise Levels	Noise levels measured in the absence of noise requiring control, frequently measured to determine the situation prior to the additional of a new noise source.
dB	Decibel. The logarithmic unit of sound level.
dB(A)	A-weighted decibel. The A-weighting approximates the response of the human ear.
$D_{nT,w}$	Weighted standardized level difference. A single number quantity of the sound level difference between two rooms. $D_{nT,w}$ is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling. Measured in accordance with BS EN ISO 16283-1 and weighted in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	The weighted element-normalized level difference. A single number rating of the sound reduction provided by a sound passing through an individual element. $D_{n,e,w}$ is typically used to define the sound insulation provided by ventilators. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Flanking	Transmission of sound energy through paths adjacent to the building element being considered. For example, sound may be transmitted around a wall by travelling up into the ceiling space and then down into the adjacent room.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4kHz, roughly equal to the range of frequencies on a piano.
Impact Sound	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor.
$L_{Aeq,t}$	The equivalent continuous sound level measured in dBA. This is commonly referred to as the average noise level. 't' is the interval time for the measurement. Typically 't' of 16hrs and 8hrs is used for day and night time ambient noise respectively or 't' is defined by the period of interest in BS4142 assessments.
$L_{A90,t}$	The noise level exceeded for 90% of the measurement period, measured in dBA. This is commonly referred to as the background noise level.
$L'_{nT,w}$	Weighted, standardized impact sound pressure level. A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard "tapper" machine. The lower the $L'_{nT,w}$, the better the acoustic performance. Measured in accordance with BBS EN ISO 140-7 and rated in accordance with BS EN ISO 717-2.
NR	Noise Rating. A single number rating which is based on the sound level in the octave bands 31.5Hz – 8kHz inclusive, generally used to assess noise from mechanical services in buildings.
Octave Band	Frequencies are often grouped together into octaves for analysis. Octave bands are labelled by their centre frequency which are: 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz and 4kHz.
Reverberation Time (T_{mf})	Reverberation time is used for assessing the acoustic qualities of a space. It is defined as the time it takes for an impulse to decay by 60dB. T_{mf} is the arithmetic average of the reverberation time in the mid frequency bands (500Hz, 1kHz and 2kHz).
R_w	Weighted sound reduction index. A single number rating of the sound insulation performance of a specific building element. R_w is measured in a laboratory. R_w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Sound Absorption	When sound hits a surface, some of the sound energy is absorbed by the surface material. Sound absorption refers to the ability of a material to absorb sound, rated from 0, complete reflection, to 1, complete absorption.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to the ability of a material to prevent the travel of sound.
Structure-borne transmission	Transmission of sound energy as vibrations via the structure of a building.

APPENDIX B

SITE PLAN
&
MEASUREMENT LOCATION


75 Hillway
Guest bedroom window of 77 Hillway
Front bathroom window of 77 Hillway (non-habitable)
Front bedroom window of 77 Hillway
ComfoAir Q450 intake and exhaust terminations
ComfoAir Q350 intake and exhaust terminations
Measurement position
GRANDIS R heat pump
N

APPENDIX C

PLANNING POLICY AND GUIDANCE

PLANNING POLICY AND GUIDANCE

Planning Policy Camden Borough Council

London Borough of Camden's planning policy is set out in a range of documents that constitute its 'development plan'. This includes its Local Plan and Camden Planning Guidance (CPG) documents. The Local Plan was adopted on 3 July 2017 and has replaced the 'Core Strategy' and 'Camden Development Policy' documents; as the basis for planning decisions and future development in the borough. The CPG for amenity spaces has been adopted January 2021.

Policy A4 – *Noise and Vibration* outlines the following aims:

> *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:*
>
> *a. development likely to generate unacceptable noise and vibration impacts; or*
> *b. 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 Local Plan outlines noise thresholds for both noise generating and noise sensitive developments and identifies three basic design criteria upon which the acceptability of any proposal is likely to be assessed:

- Green – where noise is considered to be at an acceptable level.
- Amber – where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.
- Red – where noise is observed to have a significant adverse effect.

In the context of National Planning Policy Framework and Noise Policy Statement for England, Camden Council consider the above criteria to fall into three associated categories in terms of their noise 'effects':

- LOAEL Green
- LOAEL to SOAEL Amber
- SOAEL Red

Table C of Appendix 3 defines the target noise levels for mechanical services plant and machinery:

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)	SOAL (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 57dBL_{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 and/or events exceeding 88dBL_{Amax}

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

**levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

National Planning Policy Framework and the Noise Policy Statement for England

The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) on 27th March 2012 (as amended on 20th December 2023) and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 Planning and Noise, which previously presented the government's overarching planning policy on noise.

Paragraph 180 in Section 15 of the NPPF , entitled Conserving and enhancing the natural environment, states that:

> *"Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability…"*

Paragraph 191 in Section 15 also states that:

> "*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
>
> *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason…"*

The Department for Environment Food and Rural Affairs published the Noise Policy Statement for England (NPSE) in March 2010. The explanatory note of NPSE defines the following terms used in the NPPF:

> *"NOEL – No Observed Effect Level*
>
> *This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
>
> *LOAEL – Lowest Observed Adverse Effect Level*
>
> *This is the level above which adverse effects on health and quality of life can be detected.*
>
> *2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.*
>
> *SOAEL – Significant Observed Adverse Effect Level*
>
> *This is the level above which significant adverse effects on health and quality of life occur."*

The NPSE does not define any of the above effect levels numerically.

The NPSE presents the Noise Policy Aims as:

> *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy and sustainable development:*
>
> *avoid significant adverse impacts on health and quality of life;*
>
> *mitigate and minimise adverse impacts on health and quality of life; and*
>
> *where possible, contribute to the improvement of health and quality of life."*

It can be seen that the first two bullet points are similar to Section 11 of the NPPF, with a third aim that seeks to improve health and quality of life. The NPSE later expands on the Noise Policy Aims, stating:

> *2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).*
>
> *2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.*
>
> *2.25 This aim* (the third aim)*, seeks where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."*

It is clear that noise described in the NPSE as SOAEL that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, termed the LOAEL, but not so high that it leads to significant adverse effects.

British Standard 4142

To assess the acceptability of the resultant noise levels we have consulted the relevant standards. BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' has been used to assess the likelihood any adverse impacts based on the resultant noise level from the new plant item, including any corrections for the character of the noise against the existing background noise level.

BS4142 gives guidance on assessing the likelihood of adverse impacts by calculating a 'rating level' of the new noise source and comparing its magnitude at noise sensitive locations to the existing or underlying background noise level. The background noise level is subtracted from the 'rating level' to assess the likelihood of complaints:

- The greater the difference the greater the likelihood of complaints.
- A difference of around +10dB or more is an indication of a significant adverse impact, depending on the context.
- A difference of +5dB is likely to be an indication of an adverse impact, depending on the context.

- The lower the rating level is relative to the measured background noise level, the less likely it is that the specific sound source will have an adverse impact or 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 sound impact, depending on the context.

This assessment is carried out over a one hour period for the daytime and a fifteen minute period for the night-time. For the purposes of the standard it states that daytime and night-time are typically 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

The 'rating level' of the noise source is obtained taking the following factors into consideration:

- The new plant noise (the specific noise) is measured or predicted in terms of L_{Aeq}.
- An additional correction shall be included if the noise contains a distinguishable, discrete continuous note, if the noise contains distinct impulses or if the noise is irregular enough to attract attention. The value for any tonal noise can be an addition of up to 6dB and for impulsive noise of up to 9dB.

BS 4142 goes onto state that:

> *'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 assessments and arriving at decisions, therefore, it is essential to place the sound in context.'*

BS4142 has been referenced in setting noise limits for any fixed plant proposed as part of the proposed development.

APPENDIX D

SURVEY RESULTS
(TABULAR)

EC 20817 - 75 Hillway

Thurgood Design Ltd

Tabulated Noise data

Time	L_{Aeq}	L_{AMax}	L_{A90}
12:45	48	71	39
13:00	49	60	40
13:15	49	62	40
13:30	54	84	39
13:45	51	73	42
14:00	53	64	41
14:15	55	85	40
14:30	54	71	38
14:45	49	67	38
15:00	47	62	37
15:15	48	72	38
15:30	48	64	37
15:45	45	61	36
16:00	49	65	39
16:15	46	63	36
16:30	46	64	35
16:45	47	62	36
17:00	47	62	40
17:15	51	68	37
17:30	55	77	40
17:45	47	65	37
18:00	48	68	35
18:15	49	67	38
18:30	47	61	39
18:45	45	60	34
19:00	48	66	37
19:15	47	65	35
19:30	48	67	36
19:45	46	66	33
20:00	54	85	32
20:15	45	64	33
20:30	51	70	33
20:45	44	61	33
21:00	40	55	32
21:15	42	60	32
21:30	44	63	32
21:45	46	70	31
22:00	42	63	30
22:15	45	63	30
22:30	45	60	30
22:45	41	62	29
23:00	37	54	29
23:15	37	58	28
23:30	39	58	30
23:45	33	45	28
00:00	35	50	29
00:15	32	43	29
00:30	32	43	29

Time	L_{Aeq}	L_{AMax}	L_{A90}
00:45	33	46	29
01:00	30	39	28
01:15	33	50	27
01:30	42	76	27
01:45	29	39	27
02:00	38	61	27
02:15	29	38	27
02:30	31	42	27
02:45	34	56	27
03:00	35	58	27
03:15	31	42	27
03:30	31	52	27
03:45	31	46	27
04:00	30	44	27
04:15	29	40	27
04:30	38	55	27
04:45	39	60	27
05:00	30	49	28
05:15	32	49	29
05:30	39	57	29
05:45	40	58	31
06:00	48	64	32
06:15	44	57	32
06:30	44	68	33
06:45	43	62	33
07:00	45	57	34
07:15	48	69	35
07:30	51	68	38
07:45	49	68	36
08:00	48	65	34
08:15	45	70	33
08:30	51	77	38
08:45	55	77	37
09:00	49	68	39
09:15	50	67	40
09:30	50	64	38
09:45	52	70	41
10:00	50	77	42
10:15	48	60	41
10:30	57	76	38
10:45	49	65	39
11:00	47	65	39
11:15	49	68	41
11:30	49	67	41
11:45	50	74	42
12:00	49	65	41
12:15	53	77	47
12:30	50	62	43

EC 20817 - 75 Hillway

Thurgood Design Ltd

Tabulated Noise data

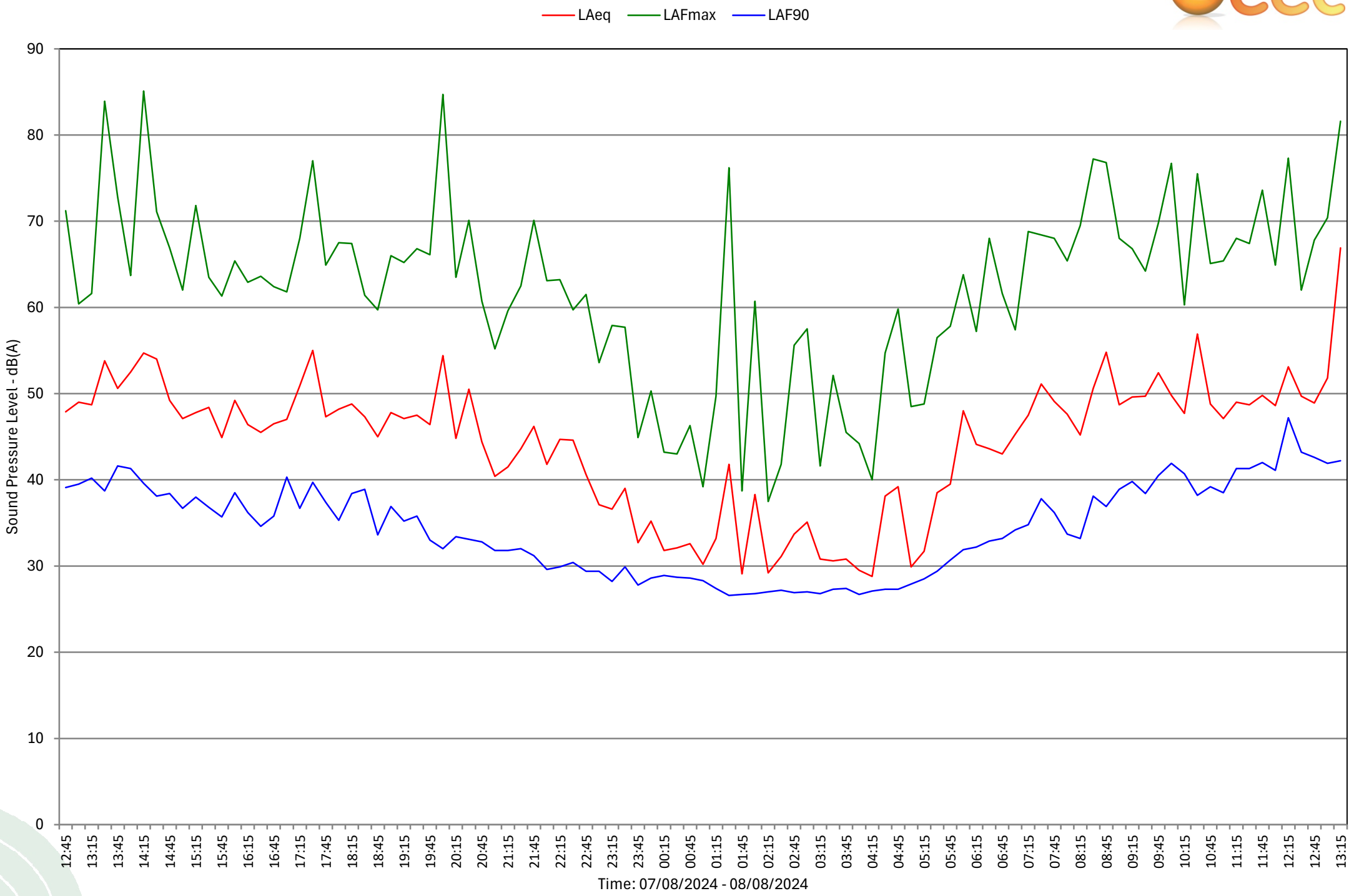
Time	L_{Aeq}	L_{AMax}	L_{A90}
12:45	49	68	43
13:00	52	70	42
13:15	67	82	42

Time	L_{Aeq}	L_{AMax}	L_{A90}

APPENDIX E

SURVEY RESULTS
(GRAPHICAL)

Noise Level Time History at 75 Hillway

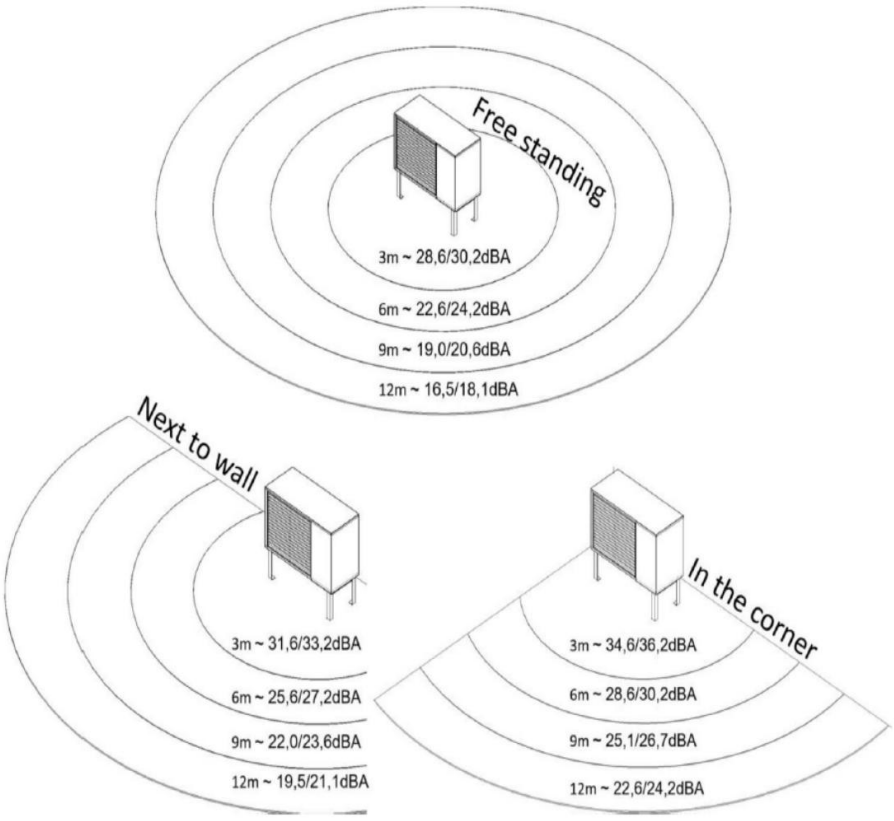


APPENDIX F

PUBLISHED PLANT NOISE DATA

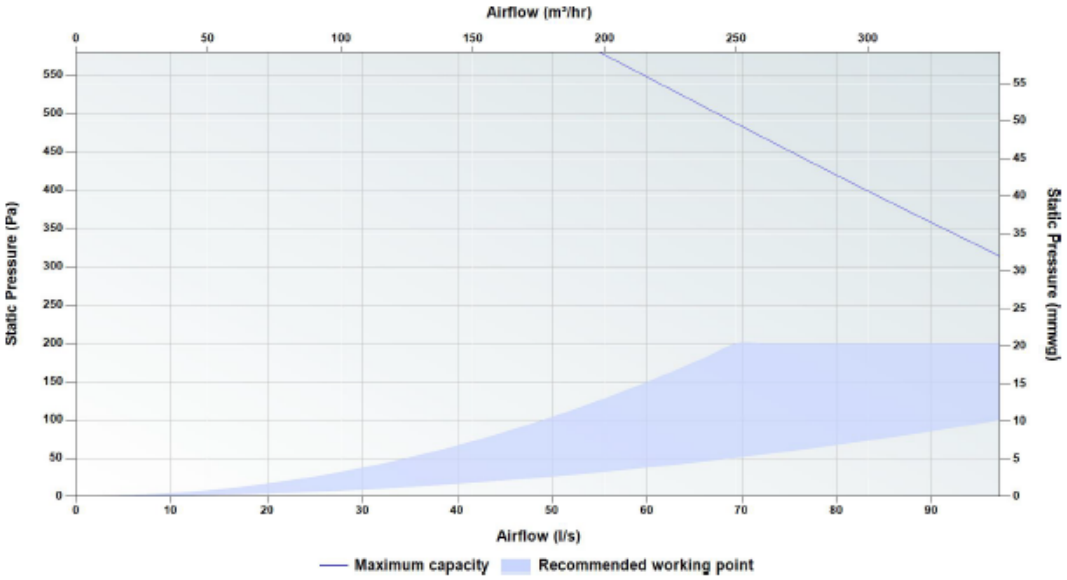
SOUND PARAMETERS

		GRANDIS N	GRANDIS R
Sound Pressure at A7/W55	db(A)	46.1	47.7
Sound Pressure at 3m	db(A)	28.6	30.2
Sound Pressure at 6m	db(A)	22.6	24.2



ComfoAir Q 350

Pressure Curve



Resistance Guard cap at 400Pa

Sound Data

Speed	Test area	Octave Band (Hz) Sound Power Level, dB								dB(A) @ 3 m
		63	125	250	500	1000	2000	4000	8000	
20%	Casing	40.2	35.2	31.2	25.5	19.6	14.8	10.6	16.7	10.4
	Supply/Exhaust	55.7	50.7	43.8	39.4	31.9	24.7	13.8	12.3	
	Extract/Intake	46.3	41.3	33.5	24.1	18.6	16.3	11.8	18.5	
40%	Casing	47.5	42.5	40.8	35.0	28.9	26.1	20.6	19.0	19.6
	Supply/Exhaust	62.1	57.1	54.8	49.4	42.7	38.3	29.4	22.9	
	Extract/Intake	52.5	47.5	43.5	33.2	26.1	22.6	17.1	18.7	
60%	Casing	53.3	48.3	48.4	42.5	36.3	35.1	28.6	20.8	27.1
	Supply/Exhaust	67.2	62.2	63.6	57.4	51.2	49.1	41.8	31.3	
	Extract/Intake	57.4	52.4	51.3	40.3	32.1	27.6	21.3	18.9	
80%	Casing	59.1	54.1	56.1	50.2	43.8	44.1	36.6	22.7	34.9
	Supply/Exhaust	72.4	67.4	72.4	65.5	59.8	60.0	54.3	39.8	
	Extract/Intake	62.4	57.4	59.3	47.5	38.2	32.7	25.6	19.1	
100%	Casing	60.0	55.0	57.2	51.3	44.9	45.5	37.8	22.9	36.1
	Supply/Exhaust	73.1	68.1	73.7	66.7	61.1	61.6	56.2	41.1	
	Extract/Intake	63.2	58.2	60.5	48.6	39.1	33.4	26.2	19.1	

Casing tested according to ISO 3741:2010. Supply and Extract tested according to ISO 5135:1997 showing induct sound power level corrected for end duct reflection according EN 13053:2019. Casing dB(A) @ 3 m given as hemispherical.

ComfoAir Q 450

Article Numbers

Description	Product Code
Support Frame	
Support frame for Zehnder ComfoAir Q350/450/600, height 252 mm	471 502 008
Filters	
Filter for Zehnder ComfoAir Q350/450/600, ISO Coarse >65% (G4), 2 Pieces	400 502 012
Filter for Zehnder ComfoAir Q350/450/600, ISO Coarse >65% (G4), 10 Pieces	400 502 014
Filter for Zehnder ComfoAir Q350/450/600, ISO Coarse >50%/ISO ePM10 >50% activated carbon (G4/M5), 2 Pieces	400 100 097
Filter for Zehnder ComfoAir Q350/450/600, ISO Coarse >65%/ISO ePM1 >65% (G4/F7), 2 Pieces	400 502 013
Filter for Zehnder ComfoAir Q350/450/600, ISO ePM1 >65% (F7), 10 Pieces	400 502 015
Accessories	
Heat exchanger for Zehnder ComfoAir Q350/450/600	400 502 008
Enthalpy exchanger for Zehnder ComfoAir Q350/450/600	400 502 010

SAP PCDB

	SFP (W/l/s)		Efficiency (%)	
	2009	2012	2009	2012
K+1	-	0.54	-	96%
K+2	0.56	0.53	96%	95%
K+3	0.48	0.55	95%	94%
K+4	0.49	0.62	95%	94%
K+5	0.53	0.73	94%	93%
K+6	0.60	0.86	94%	93%
K+7	0.68	1.04	94%	93%

SEC Class

A+

Based on average climate with local demand control

Passive House Certification

	Standard heat exchanger	Enthalpy heat exchanger
Air flow range	70–345 m³/h	70–345 m³/h
Heat recovery rate	HR = 88%	HR = 83%
Specific electric power	Pel,spec = 0.21 Wh/m³	Pel,spec = 0.21 Wh/m³
Humidity recovery		x = 71%

CERTIFIED COMPONENT

Sound Data

Speed	Test area	Octave Band (Hz) Sound Power Level, dB								dB(A) @ 3 m
		63	125	250	500	1000	2000	4000	8000	
20%	Casing	42.0	37.0	40.8	28.0	24.7	22.2	12.0	10.2	16.6
	Supply/Exhaust	54.9	49.9	50.9	41.1	36.9	33.4	22.6	2.6	
	Extract/Intake	46.8	41.8	43.5	27.2	20.2	15.1	9.5	15.5	
40%	Casing	49.0	44.0	46.3	36.8	32.1	30.7	22.8	17.8	23.4
	Supply/Exhaust	61.1	56.1	57.9	50.1	44.4	42.2	33.9	19.7	
	Extract/Intake	53.6	48.6	49.1	35.8	27.5	23.2	17.5	18.1	
60%	Casing	55.7	50.7	51.5	45.2	39.1	38.7	33.0	25.1	30.2
	Supply/Exhaust	67.0	62.0	64.6	58.6	51.6	50.6	44.5	35.9	
	Extract/Intake	60.1	55.1	54.4	44.0	34.5	30.7	25.0	20.6	
80%	Casing	61.6	56.6	56.2	52.6	45.3	45.8	42.1	31.5	36.7
	Supply/Exhaust	72.3	67.3	70.5	66.1	57.9	58.0	54.0	50.3	
	Extract/Intake	65.8	60.8	59.1	51.2	40.7	37.5	31.7	22.8	
100%	Casing	64.2	59.2	58.2	55.9	48.0	48.9	46.1	34.3	39.6
	Supply/Exhaust	74.5	69.5	73.0	69.4	60.7	61.3	58.1	56.5	
	Extract/Intake	68.3	63.3	61.1	54.4	43.4	40.4	34.6	23.7	

Casing tested according to ISO 3741:2010. Supply and Extract tested according to ISO 5135:1997 showing induct sound power level corrected for end duct reflection according EN 13053:2019. Casing dB(A) @ 3 m given as hemispherical.