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Project:

Waitrose Ruislip

Title:

Plant Noise Impact Assessment

quietly moving forward

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Revision	Date	Author	Checked

CONTENTS:

1 INTRODUCTION

1.01 Environmental Equipment Corporation Limited has been commissioned by John Lewis Partnership to undertake a noise assessment of new plant at roof level to serve the existing Waitrose & Partners at 9 Kingsend, Middlesex HA4 7DS.

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

1.03 This assessment includes:

- the setting of plant noise limits in accordance with the requirements of local authority 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 John Lewis Partnership. 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 John Lewis Partnership 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 The Waitrose supermarket is located at 9 Kingsend in Ruislip, in a predominantly residential area.

2.02 The following Google Maps image has been annotated to identify the Waitrose store along with the location of the new plant at roof level. We have also annotated the nearest residential properties that could be most affected by the proposed new replacement plant and the measurement locations used for the noise survey.

Figure 1: Site layout and nearest dwelling

2.03 The new plant will consist of:

- 2 No. dry air coolers (DAC), 6 No. refrigeration condenser units, 2 No air source heat pumps (ASHP) and 1No. AC condenser unit which are to be located at roof level within a well.
- 1 No. condenser unit and 1 No. extract fan located at first floor roof level.

The detailed proposed plant layouts are presented in Appendix B.

2.04 The proposed new plant will replace existing refrigeration and ventilation plant already installed on the roof of the store with the 2 No. ASHPs considered to be new items that are replacing existing boiler plant within the store.

2.05 The closest noise sensitive receptors to the proposed plant items are the following:

- Receptor R1, the attic window of 7 Kingsend located approximately 50m from the closest plant area with no line of sight to any of the proposed plant areas.
- Receptor R2, top floor flats at Kings Lodge along Pembroke Road, with partial line of sight to the proposed plant area on the upper roof of the store.

2.06 All other noise sensitive receptors are at a greater distance from the proposed location of the units, 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 Guidance on noise management, control and rating pertinent to this application is provided by the local Planning Policy of LBH, National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE) and British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS4142:2014). The relevant parts of these documents are presented in Appendix C.

3.02 London Borough of Hillingdon (LBH) does not provide noise requirements within their local policy but a review of similar new fixed plant installations indicates that they would seek for new plant to be 5dB below the representative background noise level as assessed under the methodology outlined in BS4142. Designing to these levels would ensure noise from the operation of the plant would have no significant adverse impact.

4 MEASUREMENTS

4.01 Environmental noise measurements were carried out over a weekday period, between 19.30 hours on Friday 5th September 2025 and concluded 12.30 hours on Monday 8th September 2025, 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 on the roof (east of plant area) at a height of approximately 6 metres above ground level. The measurement was not located within 3.5 metres of any reflecting surfaces, other than the mounting surface.
- Position 2: located on the roof (west of plant area) at a height of approximately 6 metres above ground level. 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 plant area.

5 EQUIPMENT

5.01 The equipment used for the survey **position 1** 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.	15002
	Calibration Date	18th August 2025
	Cal. Certificate No.	U51909
½" Condenser Mic. GRAS 40CD	Serial No.	545348
	Calibration Date	18th August 2025
	Cal. Certificate No.	U51908
Calibrator CAL 31	Serial No.	94723
	Calibration Date	7th May 2025
	Cal. Certificate No.	U50914

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

5.03 The equipment used for the survey **position 2** 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.

5.04 The equipment holds current accreditation and serial numbers as follows:

Sound Level Meter 01dB Fusion	Serial No.	14666
	Calibration Date	18th August 2025
	Calibration Certificate No.	U51904
½" Condenser Mic. GRAS 40CD	Serial No.	470803
	Calibration Date	15th August 2025
	Calibration Certificate No.	U51903
Calibrator CR 515	Serial No.	99534
	Calibration Date	15th August 2025
	Cal. Certificate No.	U51902

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

5.05 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 road and rail traffic and at measurement position 2 some noise from the operation of existing plant local to the measurement location. 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 (East)	Day time (0700-1900 hrs)	58	43
	Evening (1900-2300 hrs)	57	43
	Night-time (2300-0700 hrs)	53	36
2 (West)	Day time (0700-1900 hrs)	53	46
	Evening (1900-2300 hrs)	53	45
	Night-time (2300-0700 hrs)	50	42

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

7 PLANT ASSESSMENT

7.01 This application is for the installation new and replacement plant to be located at roof level at Waitrose, Ruislip.

7.02 Background noise measurement results from Position 1 have been selected as the representative background level, as this position recorded the lower noise levels and is considered to be most representative of the conditions at the nearest noise-sensitive receptors without the influences from any existing plant serving the Waitrose store.

7.03 Based on the standard requirements of London Borough of Hillingdon 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.

7.04 In accordance with the requirements of LBH, the proposed noise limits are based on being 5dB below the measured background noise level.

Receptor	Period	Measured Existing $L_{A90,T}$	Proposed Noise Limit L_{Ar}
Residential	Day	43 dB	38 dB
	Evening	43 dB	38 dB
	Night	36 dB	31 dB

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

7.05 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.

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

7.07 The details of the proposed units and their stated manufacturers sound power level are shown in Table 7.2. Copies of the manufacturer's plant data sheets are included in Appendix F.

Item	Make / Model	Operating period	Quantity	Noise Level	Notes
DAC1-2	Clade / ASL-ZAP-EC-243-ECMP-448-H	24 hours	2	35 dB(A)	Sound pressure level @10m
ASHP01-02	GalxC / PLN154HS	0700-2300hrs	2	50 dB(A)	
LT1-2	SCM Frigo / WG T067 BTDX	24 hours	2	41 dB(A)	
HT1-4	SCM Frigo / WG T067 MTDX	24 hours	4	41 dB(A)	
COND1	Daikin / RZAG125NV1	0700-2300hrs	1	68 (49 Lp)	L_W
COND2	Daikin / RZAG35B	0700-2300hrs	1	62 (48 Lp)	
EF01	Systemair / MUB 025 315EC	0700-2300hrs	1	70 dB(A)	Outlet, L_W
				41 dB(A)	Casing, L_W

8 Table 7.2: Proposed plant and published source noise levels

8.01 The refrigeration plat will be required to run at any period over 24 hours, however the ASHPs and the AC condensers and extract fan will only run during the store trading hours for the store so will not run during the night time.

8.02 Predicted noise levels have been calculated at the closest noise sensitive windows.

8.03 The windows of receptor R1, 7 Kingsland will be exposed to noise from all three plant area, whereas the flats of Kings Lodge will only be exposed to noise from plant on the upper level roof. Noise from the plant on the lower roof on the west side will be screened by the Waitrose building such that this plant will have no effect on the noise incident on the windows of Kings Lodge.

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

8.05 Table 7.3-7.5 presents the results of worst-case plant noise predictions at the worst-case locations.

Item	Noise Level		Notes
	Day	Night	
All plant equipment at all three locations	57 dB(A)	49 dB(A)	Cumulative sound pressure level at 10m
Reflections	0 dB	0 dB	No additional reflections – plant is on an open area of roof
Barrier Effect	- 10 dB	- 10 dB	No line of sight to proposed plant location
Point losses over 50 metres	- 14 dB	- 14 dB	Distance to closest window
Resultant Noise Level	**33 dB(A)**	**25 dB(A)**	At R1 – 7 Kingsland attic window

Table 7.3: R1 Plant Noise Calculation

Item	Noise Level		Notes
	Day	Night	
All plant equipment	53 dB(A)	49 dB(A)	Cumulative sound pressure level at 10m
Reflections	0 dB	0 dB	No additional reflections – plant is on an open area of roof
Barrier Effect	0 dB	0 dB	line of sight to proposed plant location (well)
Point Source losses over 80 metres	- 18 dB	- 18 dB	Distance to closest window
Resultant Noise Level	**36 dB(A)**	**31 dB(A)**	At R2 – Flats at Kings Lodge

Table 7.4: R2 Plant Noise Calculation

Receptor	Period	Proposed Noise Limit L_{Ar}	Predicted $L_{Aeq,T}$	Exceedance of noise limit
R1	Daytime	38 dB	33 dB	-5 dB
	Evening	38 dB	33 dB	-5 dB
	Night-time	31 dB	25 dB	-6 dB
R2	Daytime	38 dB	36 dB	-2 dB
	Evening	38 dB	36 dB	-1 dB
	Night-time	31 dB	31 dB	0 dB

Table 7.5: Assessment of Predicted Noise Levels Based on Proposed Noise Limit, Free-field dB(A)

8.06 It can be seen from the above tables that the noise limits are not exceeded during all periods of operation at the closest noise sensitive receptors.

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

9 CONCLUSIONS

9.01 John Lewis Partnership has appointed Environmental Equipment Corporation Limited to undertake a noise assessment of new plant at roof level to serve the existing Waitrose & Partners at 9 Kingsend, Middlesex HA4 7DS.

9.02 The assessment has been carried out in accordance with national planning guidance and the requirements of the local authority, and is based on an environmental noise survey conducted at the site over a weekend period.

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

9.04 Plant noise limits have been set based on the methodology contained in BS4142 and the results of a background noise survey, to ensure noise from the proposed plant has no adverse impact. In accordance with the NPPF, the noise limit has been 5dB below the lowest measured background noise level.

9.05 Predictions have shown that the noise criteria are met at the nearest, most affected dwellings during all periods of the plants proposed operation.

9.06 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 LOAEL.

9.07 On the basis of this assessment, it is considered that noise does not pose a material constraint to the operation of the proposed plant.

APPENDIX A

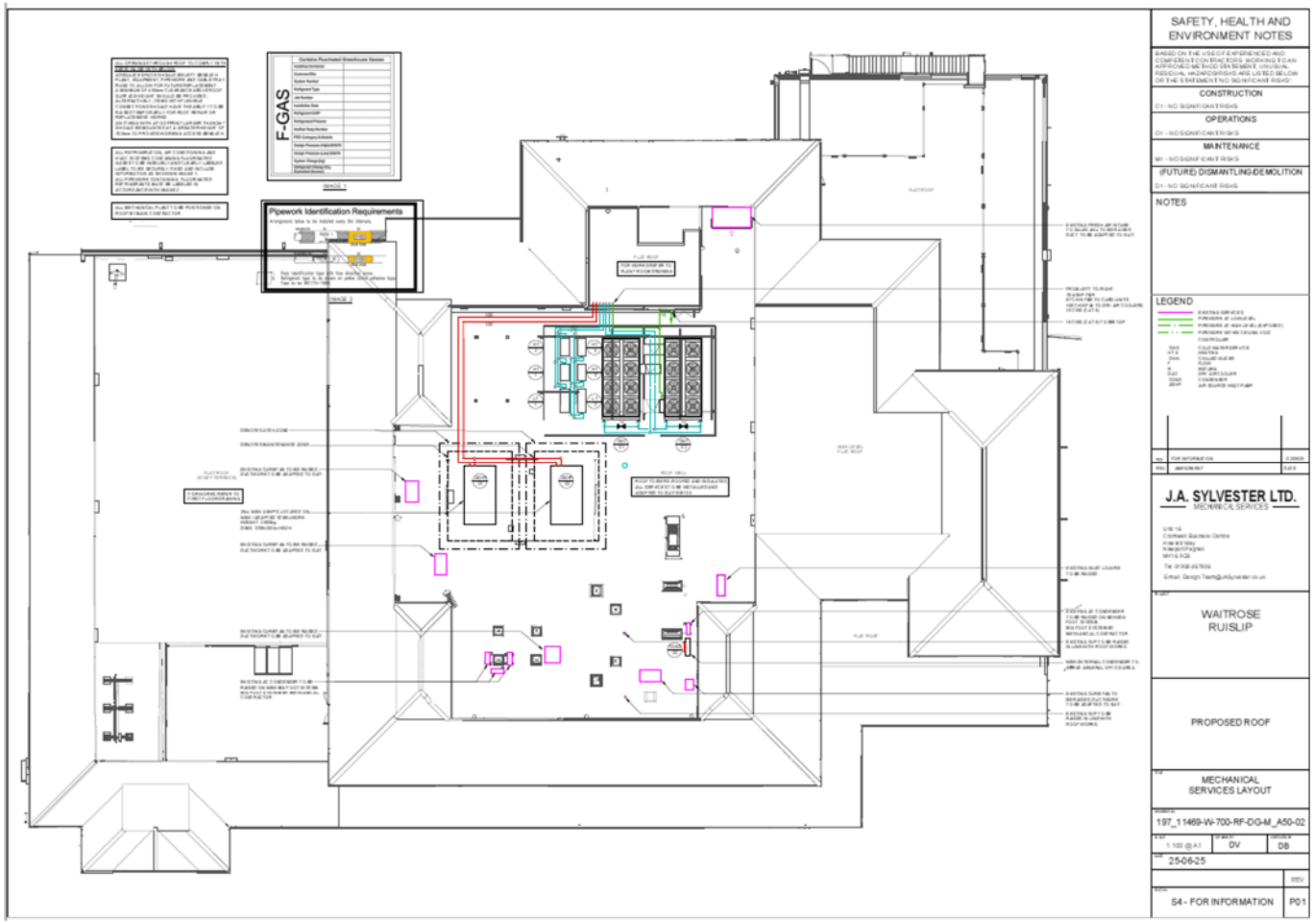
GLOSSARY OF TECHNICAL TERMS

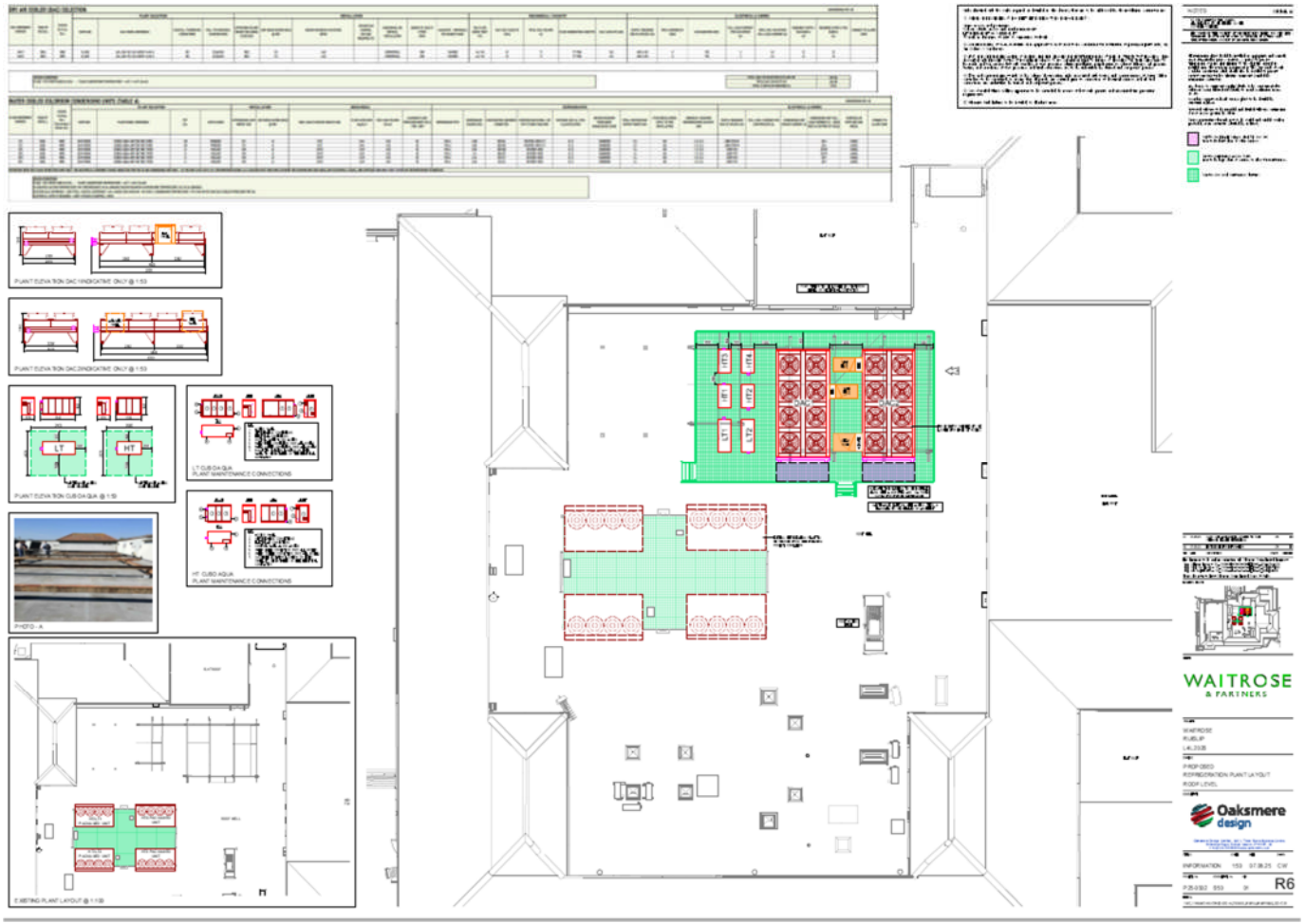
ACOUSTIC TERMINOLOGY

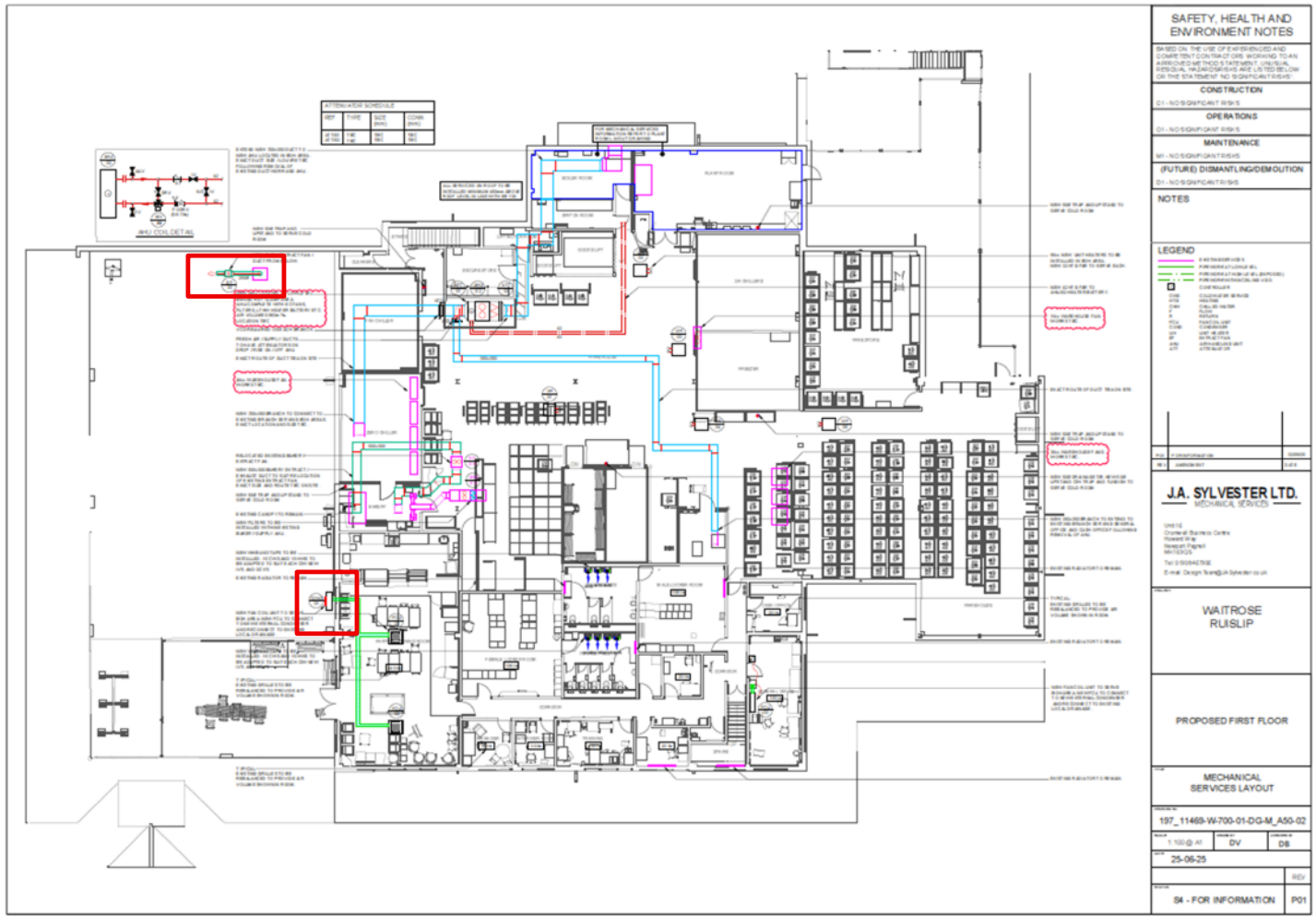
Absorption Classes	The sound absorption of a material is rated from Class A to Class E, where Class A materials provide the highest level of sound absorption.
Ambient Noise Levels	Noise levels measured in the absence of noise requiring control, frequently measured to determine the situation prior to 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

PROPOSED
PLANT LAYOUT




WAITROSE
& PARTNERS
Oaksmere
design
R6


SAFETY, HEALTH AND ENVIRONMENT NOTES
CONSTRUCTION
01 - NO SIGNIFICANT RISKS
OPERATIONS
01 - NO SIGNIFICANT RISKS
MAINTENANCE
M1 - NO SIGNIFICANT RISKS
(FUTURE) DISMANTLING/DEMOLITION
D1 - NO SIGNIFICANT RISKS
NOTES
LEGEND
J.A. SYLVESTER LTD.
MECHANICAL SERVICES
WAITROSE RUISLIP
PROPOSED FIRST FLOOR
MECHANICAL SERVICES LAYOUT
197_11469-W-700-01-DG-M_A50-02
DV
DB
25-06-25
S4 - FOR INFORMATION
P01

APPENDIX C

PLANNING POLICY AND GUIDANCE

PLANNING POLICY AND GUIDANCE

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 12th December 2024) 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 187 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 198 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 21511 - Waitrose Ruislip MP2 - North east roof

Waitrose Ltd

Tabulated Noise data

Time	L_{Aeq}	L_{AMax}	L_{A90}
19:30	66	75	54
19:45	58	84	48
20:00	56	68	48
20:15	56	65	49
20:30	59	80	49
20:45	57	77	47
21:00	57	73	48
21:15	60	80	47
21:30	57	71	47
21:45	59	84	46
22:00	57	80	47
22:15	55	68	46
22:30	55	69	45
22:45	58	80	47
23:00	57	77	46
23:15	57	79	46
23:30	56	79	43
23:45	53	67	42
00:00	53	68	41
00:15	53	71	42
00:30	54	68	43
00:45	52	68	40
01:00	53	69	40
01:15	54	74	40
01:30	52	64	38
01:45	54	77	38
02:00	51	64	37
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04:45	50	66	38
05:00	51	67	39
05:15	51	66	40
05:30	55	72	40
05:45	54	69	49
06:00	56	70	45
06:15	56	76	44
06:30	56	69	46
06:45	55	68	46
07:00	56	68	44
07:15	55	68	46

Time	L_{Aeq}	L_{AMax}	L_{A90}
07:30	57	74	47
07:45	57	71	48
08:00	57	70	47
08:15	57	69	48
08:30	58	69	49
08:45	58	74	48
09:00	57	69	48
09:15	57	67	47
09:30	58	70	48
09:45	58	73	48
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11:30	57	68	49
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12:15	58	71	50
12:30	57	78	48
12:45	57	68	48
13:00	60	77	49
13:15	59	75	49
13:30	57	72	50
13:45	57	75	49
14:00	56	69	49
14:15	58	79	48
14:30	60	79	49
14:45	57	76	49
15:00	59	79	49
15:15	56	66	48
15:30	61	80	48
15:45	59	79	48
16:00	57	80	49
16:15	56	68	48
16:30	59	79	48
16:45	57	69	48
17:00	60	79	48
17:15	57	68	48
17:30	57	69	48
17:45	57	68	49
18:00	57	66	49
18:15	58	75	48
18:30	58	69	48
18:45	58	79	47
19:00	57	68	47
19:15	57	75	48

EC 21511 - Waitrose Ruislip MP2 - North east roof

Waitrose Ltd

Tabulated Noise data

Time	L_{Aeq}	L_{AMax}	L_{A90}
19:30	63	88	47
19:45	58	76	47
20:00	57	73	47
20:15	58	79	48
20:30	57	75	47
20:45	56	78	47
21:00	56	66	48
21:15	59	82	46
21:30	56	68	46
21:45	56	75	46
22:00	56	72	46
22:15	55	68	46
22:30	55	70	45
22:45	55	65	45
23:00	55	69	45
23:15	54	72	44
23:30	54	65	45
23:45	54	66	46
00:00	53	68	42
00:15	55	70	44
00:30	54	67	43
00:45	53	66	42
01:00	53	66	43
01:15	52	68	39
01:30	51	64	39
01:45	50	65	38
02:00	52	74	38
02:15	50	68	37
02:30	48	63	37
02:45	49	64	37
03:00	46	61	36
03:15	51	72	37
03:30	49	63	36
03:45	50	69	37
04:00	53	80	37
04:15	54	81	37
04:30	51	70	38
04:45	48	65	37
05:00	52	75	38
05:15	55	76	39
05:30	53	72	39
05:45	50	66	39
06:00	52	69	40
06:15	54	71	42
06:30	54	70	43
06:45	54	70	44
07:00	53	65	43
07:15	54	68	44

Time	L_{Aeq}	L_{AMax}	L_{A90}
07:30	54	66	44
07:45	54	68	44
08:00	55	69	44
08:15	56	73	46
08:30	56	69	45
08:45	56	72	45
09:00	58	78	46
09:15	60	84	47
09:30	59	83	47
09:45	58	71	49
10:00	58	72	48
10:15	58	74	49
10:30	57	70	47
10:45	59	80	47
11:00	57	73	47
11:15	59	80	48
11:30	57	75	49
11:45	56	67	49
12:00	60	86	48
12:15	58	73	49
12:30	56	70	48
12:45	56	68	48
13:00	61	85	49
13:15	56	68	48
13:30	56	69	48
13:45	57	74	50
14:00	57	77	48
14:15	58	78	48
14:30	58	75	48
14:45	59	84	49
15:00	57	69	48
15:15	58	81	48
15:30	56	69	48
15:45	57	74	48
16:00	58	79	49
16:15	59	81	48
16:30	58	80	49
16:45	56	67	49
17:00	58	82	48
17:15	57	71	49
17:30	56	67	49
17:45	65	91	48
18:00	57	70	49
18:15	57	69	47
18:30	56	68	47
18:45	56	70	48
19:00	56	69	47
19:15	56	66	47

EC 21511 - Waitrose Ruislip MP2 - North east roof

Waitrose Ltd

Tabulated Noise data

Sheet 3 of 3

Time	L_{Aeq}	L_{AMax}	L_{A90}
19:30	56	69	47
19:45	56	65	47
20:00	55	67	48
20:15	55	64	46
20:30	55	68	46
20:45	58	77	49
21:00	57	77	47
21:15	55	66	44
21:30	55	71	46
21:45	55	69	45
22:00	55	68	44
22:15	54	72	45
22:30	52	65	43
22:45	54	70	43
23:00	52	64	41
23:15	51	65	39
23:30	54	82	41
23:45	62	92	40
00:00	52	65	39
00:15	54	77	38
00:30	49	64	39
00:45	52	68	38
01:00	50	67	37
01:15	47	66	37
01:30	54	79	37
01:45	50	72	36
02:00	50	72	37
02:15	45	63	37
02:30	46	64	37
02:45	47	69	37
03:00	46	64	38
03:15	53	78	38
03:30	47	63	37
03:45	48	65	37
04:00	46	64	37
04:15	49	70	38
04:30	49	66	39
04:45	51	67	40
05:00	53	68	40
05:15	54	69	43
05:30	55	70	44
05:45	57	72	46
06:00	57	68	47
06:15	57	69	49
06:30	58	71	50
06:45	58	71	50
07:00	59	73	50
07:15	59	76	50

Time	L_{Aeq}	L_{AMax}	L_{A90}
07:30	61	86	50
07:45	60	68	51
08:00	59	68	50
08:15	59	74	49
08:30	59	69	51
08:45	59	78	50
09:00	58	79	50
09:15	59	74	49
09:30	59	71	50
09:45	57	70	50
10:00	57	70	49
10:15	57	69	49
10:30	57	67	48
10:45	56	68	48
11:00	58	79	49
11:15	58	70	50
11:30	58	74	49
11:45	58	70	50
12:00	57	69	49
12:15	56	68	49
12:30	57	71	49

EC 21511 - Waitrose Ruislip MP1 Partners Terrace Roof

Waitrose Ltd

Tabulated Noise data

Time	L_{Aeq}	L_{AMax}	L_{A90}
19:30	55	74	49
19:45	52	60	50
20:00	52	64	49
20:15	54	71	49
20:30	53	73	49
20:45	55	71	49
21:00	54	72	49
21:15	55	78	48
21:30	51	59	48
21:45	51	63	47
22:00	53	77	47
22:15	50	60	46
22:30	53	80	46
22:45	57	78	47
23:00	50	64	46
23:15	54	66	45
23:30	49	66	44
23:45	48	59	44
00:00	48	58	44
00:15	48	62	44
00:30	47	61	44
00:45	47	60	43
01:00	48	61	44
01:15	48	71	44
01:30	46	62	44
01:45	46	61	44
02:00	46	59	44
02:15	47	63	44
02:30	46	64	44
02:45	46	61	44
03:00	46	56	44
03:15	50	68	44
03:30	46	56	45
03:45	46	58	44
04:00	45	57	43
04:15	46	64	43
04:30	49	70	44
04:45	50	68	45
05:00	50	67	45
05:15	50	66	47
05:30	49	61	45
05:45	57	74	53
06:00	54	64	49
06:15	52	69	48
06:30	53	69	49
06:45	54	77	49
07:00	52	66	48
07:15	53	62	50

Time	L_{Aeq}	L_{AMax}	L_{A90}
07:30	53	65	51
07:45	54	66	49
08:00	55	71	49
08:15	53	68	48
08:30	56	82	48
08:45	54	77	48
09:00	52	72	48
09:15	51	62	48
09:30	52	63	49
09:45	52	65	48
10:00	52	61	49
10:15	54	75	49
10:30	53	69	49
10:45	52	65	49
11:00	52	60	49
11:15	52	64	49
11:30	52	66	50
11:45	55	74	50
12:00	53	64	50
12:15	56	68	52
12:30	53	65	50
12:45	53	68	50
13:00	54	74	49
13:15	53	70	50
13:30	54	68	51
13:45	54	67	51
14:00	53	62	51
14:15	53	62	50
14:30	56	78	51
14:45	53	64	50
15:00	56	70	51
15:15	54	67	50
15:30	54	66	50
15:45	56	71	50
16:00	54	66	50
16:15	53	67	50
16:30	54	74	50
16:45	53	63	50
17:00	54	71	50
17:15	52	65	50
17:30	52	64	49
17:45	52	68	49
18:00	52	64	49
18:15	52	67	49
18:30	52	64	49
18:45	52	69	49
19:00	52	61	48
19:15	51	64	48

EC 21511 - Waitrose Ruislip MP1 Partners Terrace Roof

Waitrose Ltd

Tabulated Noise data

Time	L_{Aeq}	L_{AMax}	L_{A90}
19:30	54	77	48
19:45	51	65	48
20:00	52	66	48
20:15	54	70	48
20:30	52	65	48
20:45	51	65	47
21:00	50	68	47
21:15	52	64	47
21:30	49	57	46
21:45	50	70	46
22:00	50	60	47
22:15	50	59	47
22:30	49	58	47
22:45	50	61	47
23:00	49	59	46
23:15	49	60	46
23:30	50	59	47
23:45	50	65	48
00:00	49	60	47
00:15	50	61	47
00:30	49	62	46
00:45	48	59	46
01:00	47	58	45
01:15	47	59	44
01:30	46	56	44
01:45	46	57	44
02:00	46	60	44
02:15	50	66	44
02:30	47	65	43
02:45	45	60	43
03:00	44	54	43
03:15	45	55	43
03:30	45	55	43
03:45	45	53	43
04:00	45	59	43
04:15	45	58	43
04:30	46	60	43
04:45	46	68	43
05:00	49	68	44
05:15	49	75	44
05:30	52	70	44
05:45	48	63	44
06:00	56	73	45
06:15	51	68	46
06:30	49	61	46
06:45	53	76	46
07:00	50	62	47
07:15	50	65	46
07:30	50	74	46
07:45	49	60	46
08:00	52	69	46
08:15	50	65	46
08:30	51	66	47
08:45	52	72	46
09:00	49	59	47
09:15	50	64	48
09:30	51	64	48
09:45	54	70	49
10:00	51	65	48
10:15	55	70	49
10:30	52	63	49
10:45	52	66	50
11:00	52	63	50
11:15	54	66	50
11:30	54	73	51
11:45	54	69	50
12:00	56	81	50
12:15	54	69	51
12:30	54	76	51
12:45	53	66	50
13:00	55	68	51
13:15	53	65	50
13:30	53	70	51
13:45	56	72	51
14:00	54	67	51
14:15	53	64	50
14:30	55	72	51
14:45	54	65	51
15:00	54	66	51
15:15	54	76	51
15:30	55	68	51
15:45	53	66	50
16:00	54	75	50
16:15	55	72	50
16:30	53	65	50
16:45	54	65	51
17:00	53	66	49
17:15	54	65	50
17:30	53	68	50
17:45	55	68	50
18:00	52	62	49
18:15	51	60	48
18:30	52	65	49
18:45	52	67	49
19:00	52	65	49
19:15	53	74	49

EC 21511 - Waitrose Ruislip MP1 Partners Terrace Roof

Waitrose Ltd

Tabulated Noise data

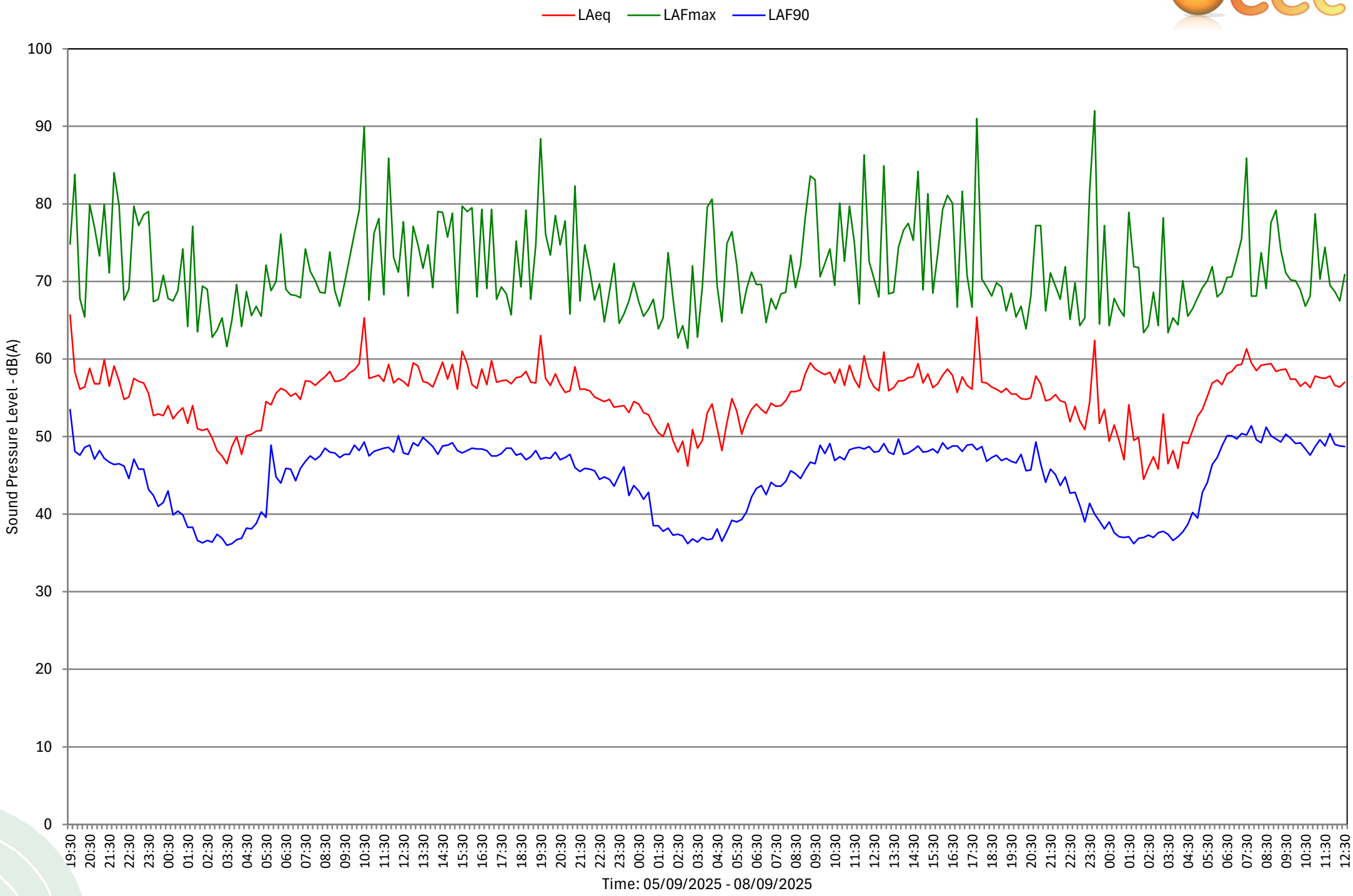
Time	L_{Aeq}	L_{AMax}	L_{A90}
19:30	52	67	49
19:45	52	72	49
20:00	51	63	48
20:15	50	61	47
20:30	50	63	48
20:45	61	73	53
21:00	51	66	47
21:15	53	67	47
21:30	50	71	47
21:45	50	63	46
22:00	49	64	46
22:15	49	59	45
22:30	48	60	45
22:45	48	61	45
23:00	47	57	44
23:15	47	58	44
23:30	49	72	44
23:45	50	77	43
00:00	47	60	43
00:15	47	67	43
00:30	45	58	43
00:45	45	59	43
01:00	44	57	42
01:15	45	57	42
01:30	50	76	43
01:45	48	68	42
02:00	44	55	42
02:15	44	55	43
02:30	44	55	43
02:45	44	56	42
03:00	44	58	43
03:15	45	59	42
03:30	44	57	42
03:45	44	56	42
04:00	44	55	43
04:15	46	63	43
04:30	48	65	44
04:45	51	79	45
05:00	48	60	45
05:15	51	67	46
05:30	50	66	47
05:45	53	76	48
06:00	55	72	50
06:15	56	78	50
06:30	55	68	51
06:45	54	70	51
07:00	55	72	51
07:15	54	65	51

Time	L_{Aeq}	L_{AMax}	L_{A90}
07:30	54	72	51
07:45	54	67	51
08:00	53	74	50
08:15	54	73	50
08:30	54	71	50
08:45	54	78	49
09:00	52	63	49
09:15	54	70	50
09:30	55	71	49
09:45	53	63	50
10:00	52	67	49
10:15	52	70	48
10:30	51	62	48
10:45	52	69	49
11:00	53	69	49
11:15	54	65	50
11:30	54	68	50
11:45	55	80	50
12:00	54	66	50
12:15	53	67	50
12:30	52	74	49

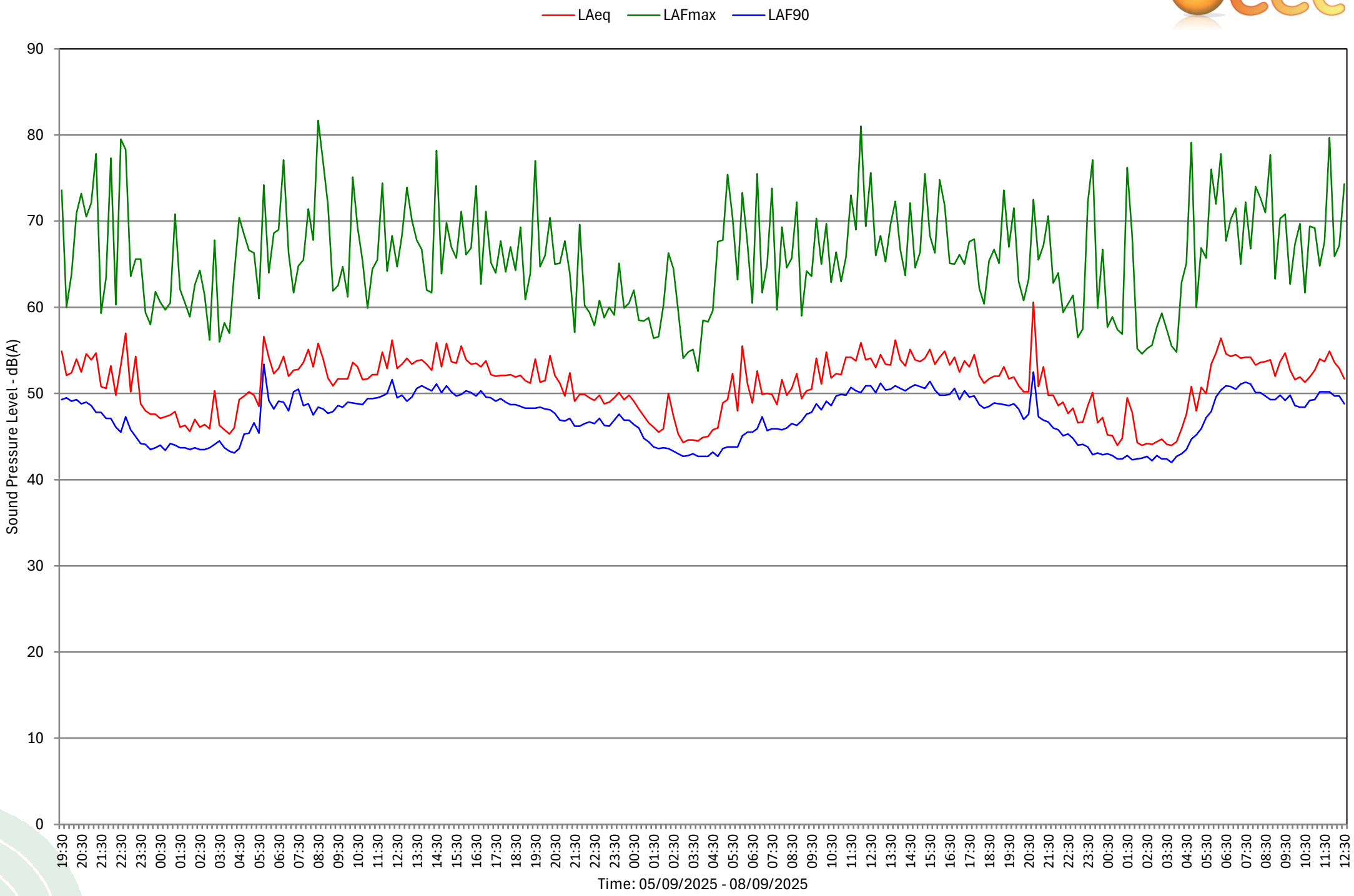
APPENDIX E

SURVEY RESULTS
(GRAPHICAL)

Noise Level Time History at Waitrose Ruislip MP2 - North east roof



Noise Level Time History at Waitrose Ruislip MP1 Partners Terrace Roof



APPENDIX F

PUBLISHED PLANT NOISE DATA

DRY AIR COOLER (DAC) SELECTION

DAC REFERENCE NUMBER	YEAR OF INSTALL	STATUS Existing New	PLANT SELECTION					
			SUPPLIER	DAC MODEL REFERENCE	COASTAL / CORROSIVE ATMOSPHERE	COIL / FIN MATERIAL CONSTRUCTION	APPROXIMATE UNIT WEIGHT INCLUDING FLUID (KG)	UNIT NOISE RATING DB(A) @ 10M
DAC1	2026	NEW	CLADE	ASL-ZAP-EC-243-ECMP-448-H	NO	CU/ALMG	1822	35
DAC2	2026	NEW	CLADE	ASL-ZAP-EC-243-ECMP-448-H	NO	CU/ALMG	1822	35

DESIGN CONDITIONS
FLUID = 15% PROPYLENE GLYCOL - FLUID FLOW/RETURN TEMPERATURE = +40° / +46°C (Gen3)

WATER COOLED COLDROOM CONDENSING UNITS (TABLE A)

PLANT REFERENCE NUMBER	YEAR OF INSTALL	STATUS Existing New Refurbished Offsite Ref.	PLANT SELECTION				INSTALLATION	
			SUPPLIER	PLANT MODEL REFERENCE	SST (°C)	APPLICATION	APPROXIMATE UNIT WEIGHT (KG)	UNIT NOISE RATING DB(A) @ 10M
LT1	2026	NEW	SCM FRIGO	CUBO2 AQUA UMT WG T067 BTDX	-30	FREEZER	176	41
LT2	2026	NEW	SCM FRIGO	CUBO2 AQUA UMT WG T067 BTDX	-30	FREEZER	176	41
HT1	2026	NEW	SCM FRIGO	CUBO2 AQUA UMT WG T067 MTDX	-8	CHILLER	150	41
HT2	2026	NEW	SCM FRIGO	CUBO2 AQUA UMT WG T067 MTDX	-8	CHILLER	150	41
HT3	2026	NEW	SCM FRIGO	CUBO2 AQUA UMT WG T067 MTDX	-5	CHILLER	150	41
HT4	2026	NEW	SCM FRIGO	CUBO2 AQUA UMT WG T067 MTDX	-5	CHILLER	150	41

IMPORTANT NOTE FOR CLADE HYDRO MINI UNITS ONLY: THE ELECTRICAL CURRENTS STATED ABOVE ARE FOR THE CLADE CONDENSING UNIT ONLY. AS THE UNIT ALSO ACTS AS A DISTRIBUTION BOARD, ALL CABLING MUST TAKE INTO ACCOUNT THE

DAIKIN Sky Air Alpha-

2 Specifications

1 - 1 RZAG-NV1

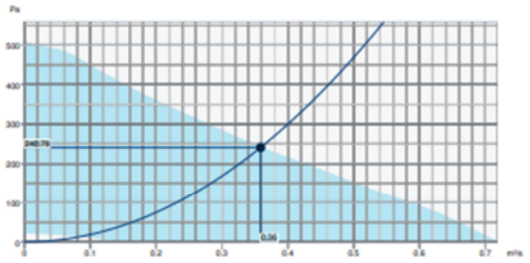
Technical Specifications					RZAG71NV1	RZAG100NV1	RZAG125NV1
Casing	Colour				Ivory white		
	Material				Painted galvanized steel plate		
Dimensions	Unit	Height		mm	870		
		Width		mm	1,100		
		Depth		mm	460		
	Packed unit	Height		mm	1,043		
		Width		mm	1,205		
		Depth		mm	509		
Weight	Unit			kg	81	85	9
	Packed unit			kg	92	95	10
Packing	Weight			kg	10		
Heat exchanger	Fin	Type			WF fin		
		Treatment			Anti-corrosion treatment (PE)		
Fan	Type				Propeller		
	Discharge direction				Horizontal		
	Quantity				1		
	Air flow rate	Cooling	Nom.	m^3/min	68	67	80
		Heating	Nom.	m^3/min	75	82	80
			Partial	m^3/min	-		45
Fan motor	Quantity				1		
	Model				Brushless DC motor		
	Output			W	234		
	Drive				Direct drive		
Compressor	Quantity				1		
	Type				Hermetically sealed swing compressor		
Operation range	Cooling	Ambient	Min.	°CDB	-20		
			Max.	°CDB	52		
	Heating	Ambient	Min.	°CWB	-20		
			Max.	°CWB	18		
Sound power level	Cooling			dBA	64	66	69
	Heating			dBA	-		68 (1)
Sound pressure	Cooling	Nom.		dBA	46	47	49

Outdoor Units			RZAG35B
Dimensions	Height x Width x Depth	mm	734 x 870 x 373
Weight		kg	52
Electrical Details	Power Supply		1ph
	Maximum Input Current (MCA)	A	13.42
	Max Fuse Size	A	16
Interconnection Wiring	Core / Cable Size		3+E / 1.5
Piping Connections	Liquid / Gas	inches (mm)	1/4 (6.4) / 3/8 (9.5)
Pipework	Maximum Length	m	50
	Maximum Vertical Rise	m	30
	Precharged to	m	30
	Additional charge	g/m	20
	Holding charge	kg	1.55
Sound Pressure (Cooling)	Nominal	dBA	48
Sound Pressure (Heating)	Nominal	dBA	48
Sound Power (Cooling)		dBA	62

systemair **MUB 025 315EC Multibox** Item Number: **#235423** Operating Mode: **230V 1~ 50/60Hz - 90° air flow**

Performance

Performance curve



Hydraulic data	
Required air flow	0.36 m³/s
Required static pressure	241 Pa
Working air flow	0.36 m³/s
Working static pressure	241 Pa
Air density	1.204 kg/m³
Power	168.8 W
Fan control - RPM	1,556 rpm
Current	1.39 A
SFP	0.471 kW/m³/s
Control voltage	10.0 V
Supply voltage	230 V

Sound power level		63	125	250	500	1k	2k	4k	8k	Total
Inlet	dB(A)	31	53	55	60	64	65	58	48	69
Outlet	dB(A)	33	54	56	61	66	66	59	50	70
Surrounding	dB(A)	10	33	29	29	34	38	25	12	41
Sound pressure level at 3m (20m² Sabine)	dB(A)	-	-	-	-	-	-	-	-	34
Sound pressure level at 3m free	dB(A)	-	-	-	-	-	-	-	-	20

PROJECT PROPOSAL

..

TECHNICAL DATA SELECTION
PRELIMINARY

SW: # DB: #

PROJECT N.: ..
DATE: 31-07-2025
PROJECT NAME:

Output data

Requested model **PLN 154 H_cc heating**

Cooling				
Data Inputs		USR W 24°C 18°C 30% SRC A 35.0°C 40%	USR W 24°C 18°C 30% SRC A 35.0°C 40%	USR W 24°C 18°C 27% SRC A 35.0°C 40%
Cooling capacity [UNI EN 14511]	kW	183.0	183.0	183.0
Water Flow user side	l/h	26300	26300	26300
Water Pressure drops user side	kPa	30	30	30
Total Power input [UNI EN 14511]	kW	54.8	54.8	54.8
Total Absorbed Current	A	121.8	121.8	121.8
EER [UNI EN 14511]	W/W	3.34	3.34	3.34
LP Pumps (option) User side - Available pressure head	kPa	t.b.d.	t.b.d.	t.b.d.
HP Pumps (option) User side - Available pressure head	kPa	t.b.d.	t.b.d.	t.b.d.
Heating				
Data Inputs		USR W 65°C 70°C 30% SRC A 0°C 87%	USR W 65°C 70°C 30% SRC A -4°C 87%	USR W 60°C 70°C 27% SRC A -4°C 87%
Heating capacity [UNI EN 14511]	kW	125.0	115.5	115.3
Water Flow user side	l/h	21900	20280	10130
Water Pressure drops user side	kPa	20	18	5
Total Power input [UNI EN 14511]	kW	68.4	68.1	66.5
Total Absorbed Current	A	138.7	138.2	135.0
COP [UNI EN 14511]	W/W	1.83	1.70	1.73
SCOP	Wh/Wh	4.00	4.00	4.00
Eta s (Seasonal Heating Efficiency)		157.00	157.00	157.00
Heating Seasonal Efficiency Class (Range A+++ -> D)		A+++	A+++	A+++
LP Pumps (option) User side - Available pressure head	kPa	t.b.d.	t.b.d.	t.b.d.
HP Pumps (option) User side - Available pressure head	kPa	t.b.d.	t.b.d.	t.b.d.
Common Data				
Maximum absorbed current (FLA) [without options]	A	157	157	157
Start up current (LRA) [without options]	A	320	320	320
Start up current with Soft Starter kit [without options]	A	261	261	261
Sound power level Lw (Low Noise) [without options]	dB(A)	82	82	82
Sound pressure level Lp (Low Noise) [EN3744]	dB(A)	53	53	53