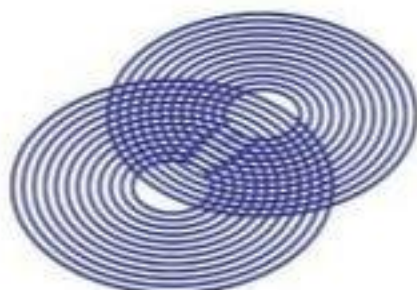


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Report E21139/PCA/R1-A

Issue Date 5 January 2022

Project **Plot 4A Dunsbury Park**
Fitzwygram Way, Havant, PO9 4EE

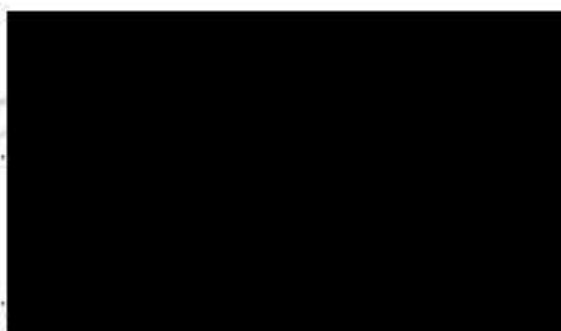
Title **Planning Compliance Assessment**
Sub Title **Mechanical Plant Equipment**

Client Area Europe Ltd
The Old Post Office,
33 Station Road,
Egham TW20 9LA

Case No APP/20/00508

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Revision	Reason	Checked	Signature
A	Updated mechanical plant information from the client	GS	

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CONTENTS

1.	INTRODUCTION	1
2.	PLANNING CONDITION REQUIREMENTS AND GUIDANCE	2
3.	SITE DESCRIPTION	4
4.	ASSESSMENT METHODOLOGY	5
5.	NOISE IMPACT ASSESSMENT AND DISCUSSION	7
6.	CONCLUSION	11

List of Tables

Table E21139/T1 - Sound Power Levels (Chiller and Dry Coolers)	7
Table E21139/T2 - Sound Pressure Levels (Pump Motors)	7
Table E21139/T3 - Sound Power Levels (Condensers-Cooling Only)	8
Table E21139/T4 - Air Handling Units	8
Table E21139/T5 - Sound Power Levels (Extract Fan)	8
Table E21139/T6- BS 4142:2014 Assessment (Night time)	9
Table E21139/T7 - Assessment Summary	9

List of Attachments

Appendix A: GLOSSARY OF ACOUSTIC TERMS
Appendix B: STANTEC NOISE IMPACT ASSESSMENT REPORT
Appendix C: PROPOSED PLANT NOISE DATA
Appendix D: PROPOSED PLANT LOCATIONS

Figure E21139/ NM 1 : Noise Contour Map at 4m height

Figure E21139/ SP 1 : Site Plan Showing Plant Locations and Nearest Noise Sensitive Receptors

1. INTRODUCTION

- 1.1 Adnitt Acoustics have been commissioned by Area Europe Ltd to undertake an acoustic assessment in support of the new fixed mechanical at Plot 4A Dunsbury Park, Fitzwygram Way, Havant, PO9 4EE.
- 1.2 An assessment of the impact from the mechanical plant equipment is required as part of the Reserved Matters Application, APP/20/00508, Condition 7.
- 1.3 This assessment is for the fixed mechanical plant equipment only.
- 1.4 This assessment refers to the noise survey results published within the Stantec Noise Impact Assessment Report (ref. 48359/3001 01 Rev. 00, dated July 2020).
- 1.5 Since this is a technical report it will be necessary to make use of some technical terms. To assist the reader, a glossary has been included in Appendix A.

Statement of Qualification

- 1.6 This report has been prepared by Sarah Barnes. Sarah holds an undergraduate degree, in Audio Technology from Buckinghamshire New University.
- 1.7 Sarah is a Technician member of the Institute of Acoustics and joined Adnitt Acoustics in November 2020. Sarah was supervised by Juan L. Rioperez.
- 1.8 The assessment was undertaken by Juan L. Rioperez BEng(Hons) MSc MIOA for and on behalf of Adnitt Acoustic Services Ltd.
- 1.9 Juan holds a Beng(Hons) in Telecommunications Engineering (Sound and Image) from the Technical University of Madrid (UPM) (2014) and an MSc in Environmental and Architectural Acoustics from London South Bank University.
- 1.10 Juan has over six years' post-graduate experience as an Acoustic Consultant having joined Adnitt Acoustics in September 2014 and is a corporate member of the Institute of Acoustics (MIOA).

2. PLANNING CONDITION REQUIREMENTS AND GUIDANCE

- 2.1 The following planning condition was imposed in the Reserved Matters Approval, APP/20/00508.

7 The development shall be carried out in strict accordance with the Plot 4 Noise Assessment
Reason: To safeguard the amenities of nearby residents and having due regard to policies CS16 and DM10 of the Havant Borough Local Plan (Core Strategy) 2011 and the National Planning Policy Framework.

- 2.2 We understand that the 'Plot 4 Noise Assessment' referred to in the condition is the Stantec Noise Impact Assessment Report (ref. 48359/3001 01 Rev. 00, dated July 2020) which is appended for reference in Appendix B, and referred to as the Stantec Report.
- 2.3 We have been commissioned by Area to undertake an assessment of the proposed fixed mechanical plant equipment only. The relevant criteria from the Stantec Report are as follows:

- 2.3.1 The mechanical plant noise limit at 1m from the nearest noise sensitive premises provided in the Stantec Noise Impact Assessment Report:

2.3 Proposed Assessment Criteria

- 2.3.1 Based on guidance provided within BS 4142:2014+A1 2019, the assessment criteria for industrial noise are proposed below.

Table 2.1: Proposed Criteria - Industrial Noise

Location	Period	Difference between the Rating Level ($L_{A,T,r}$) and the Background Sound Level ($L_{A90,15mins}$)
1 m from nearest noise sensitive premises	24 Hours	+5 dB

- 2.3.2 The specific noise level for the fixed mechanical plant in the Stantec Report is highlighted in red.

- 5.8.1 **Table 5.6** details the results of the BS4142:2014 assessment of the proposed development.

Table 5.6: BS4142:2014 Assessment Results

Description	Operational Periods		
	Daytime (07:00 – 23:00 hours) T = 1 hour	Night-Time (23:00 – 07:00 hours) T = 15mins	Night-Time (06:30 – 07:00 hours) T = 15mins
Calculated Specific Sound Level from Delivery Yard	23	-	28
Calculated Specific Sound Level from Atmospheric Building Services	34	34	34
Calculated Specific Sound Level from Internal Operations	25	25	25
Calculated Rating Sound Level at Receptor A (dB $L_{A,T,r}$)	35	35	35
Background Sound Level (dB $L_{A90,T}$)	48	31	45
Excess of Rating over Background Sound Level (dB)	-13	+4	-10
Assessment of Impact	Indication of a low impact, depending on the context	Indication of a less than adverse impact, depending on the context	Indication of a low impact, depending on the context

2.4 To comply with the requirements of Condition 7 the following noise limits will be used in the assessment:

- The difference between the Rating Level ($L_{A,r,T,r}$) and the Background Sound Levels ($L_{A90,15mins}$) is below the Stantec assessment criteria of +5dB; and
- The specific sound levels from atmospheric building services (fixed mechanical plant equipment) are equal to or below the levels defined in Table 5.6 of the Stantec Report (i.e. 34dB $L_{Aeq,1hour}$ during the daytime and 34dB $L_{Aeq,15min}$ during the night-time period).

3. SITE DESCRIPTION

- 3.1 The site is located at Plot 4A Dunsbury Park, Fitzwygram Way, Havant, PO9 4EE.
- 3.2 The local area is mainly industrial and commercial units to the west of Plot 4a and mainly residential dwellings to the east.
- 3.3 The nearest noise sensitive receptors have been identified to be the residential properties on Calshot Road to the east of the site.
- 3.4 Based on the Planning Noise Assessment undertaken by Stantec (report ref. 48359/3001 01 Rev. 00 dated July 2020), the existing noise environment has been found to be dominated mainly by 'vehicular movements on the surrounding road network, specifically the A3(M) to the west of the site'.
- 3.5 The main mechanical plant items consist of; 3x chillers, 2x dry coolers, 2x motor pumps and 8x additional condensers.
- 3.6 The mechanical plant locations are detailed in Section 5 and on the appended site plan E21139/SP 1 and proposed drawings provided by the client included Appendix D.

4. ASSESSMENT METHODOLOGY

Stantec Noise Survey

- 4.1 A planning noise survey and impact assessment were undertaken by Stantec in July 2020 (report ref. 48359/3001 01 Rev. 00 dated July 2020).
- 4.2 Unattended noise measurements were undertaken by Stantec between approximately 08:00 hours on Wednesday 04 March 2020 and approximately 12:00 on Thursday 05 March 2020 at a location considered representative of the nearest noise sensitive receptors located to the east of the site.
- 4.3 The acoustic parameters L_{Aeq} , L_{A90} and L_{Amax} were measured over 15-minute periods during the noise survey.
- 4.4 The noise survey results reported by Stantec have been used for this assessment and have been reproduced below:

4 Environmental Sound Survey Results

4.1.1 The results of the survey are presented in the time history graph in **Appendix C**.

4.1.2 A summary of the survey results is detailed in **Tables 4.1**.

Table 4.1: Summary of Measured Environmental Sound Survey Results – LT1

Date	Period, T	Measured Sound Level (dB)		
		$L_{Aeq,T}$	Typical* L_{A90max}	Typical** $L_{A90,T}$
04/03/2020 – 05/03/2020	Daytime (07:00 – 23:00 hours)	54	-	48
	Night-time (23:00 – 07:00 hours)	48	66	31

* Based on the 10th highest measured L_{Amax} level.

** Calculated based on the statistical distribution of background sound levels during the measurement period in general accordance with guidance in BS4142:2014.

- 4.5 The noise measurements are understood to be undertaken under free field conditions and the above noise levels are therefore free field values.
- 4.6 Refer to the attached Stantec Report for further details on measurement equipment, methodology, meteorological conditions, etc.
- 4.7 The nearest noise sensitive receptors have been identified to be the residential properties on Calshot Road to the east of the site.

Noise Model

- 4.8 A 3D noise model has been produced using proprietary software Cadna(A) v.2021 to calculate the specific sound levels at Calshot Road.
- 4.9 The model was created using the drawings and mechanical plant locations provided by the client.
- 4.10 The following parameters were used in setting up the Cadna(A) 2021 model:
 - Industry: ISO 9613 (for sound propagation and barrier calculations)
 - Ground absorption set to 0.5;

- All buildings except for the proposed building set to 'Structured façade';
- Proposed building set to fully reflect
- Order of reflections set to 2;
- Noise sources defined based on manufacturer's noise data;
- Open Street Map data has been used for the buildings.

5. NOISE IMPACT ASSESSMENT AND DISCUSSION

5.1 The nearest noise sensitive receptor has been identified to be the adjacent residential dwellings at Calshot Road located approximately 250m away from the proposed plant.

5.2 Details of the plant noise manufacturer's data and the proposed plant locations provided by the client are included in Appendix C and Appendix D as follows:

- Plant Area 1 (North)
 - 3x Ciat Aquaciat -LD1800R Ultra low noise chillers
- Plant Area 2 (North)
 - 2x Piovan - AFCV290 dry cooler units
 - 2x Piovan - Pump Motors
- Plant Area 3 (South)
 - Split System Tool Store - 1x PUZ-M140YKATH
 - AHU 7
- Plant Area 4 Warehouse Offices (South)
 - System 1 - 1x PURYM300YMW-A1
 - System 2 - 1x PURYM200YMW-A1
 - Split System Comms Room -2x PUZ-ZM50VKA2
- Plant Area 5 Main Office and Logistics (East)
 - Split System Logistics - 1x SUZ-M60VAR2.TH
 - System 3 - 1x PURYM300YMW-A1
 - System 4 - 1x PURYM300YMW-A1

5.3 The following table summarises the noise levels for the proposed mechanical plant items that were provided by the client. The proposed locations are shown on the attached site plan, E21139/SP1.

Manufacturer and Model	A-Weighted Global Sound Power (dB(A))	Sound Power Levels (dB re 10 ⁻¹² W)							
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Ciat LD1800R	87	86	83	84	86	82	80	72	68
Piovan - AFCV290	86	65	64	74	80	80	80	78	69

Table E21139/T1 - Sound Power Levels (Chiller and Dry Coolers)

All values are partial free-field

*Overall Levels Supplied

Manufacturer and Model	Distance	Sound Pressure Level dB(A)
Piovan - Pump Motor	1m	75*

Table E21139/T2 - Sound Pressure Levels (Pump Motors)

All values are partial free-field

*Sound Pressure Level measured at 1 meter distance in free field according to manufacturer's data. 5.5 kW has been assumed for each pump motor.

Manufacturer and Model	Sound Power Level dB(A)
PURY-M300YNW-A1	80*
PURY-M200YNW-A1	76*
PURY-SUZ-M60VAR2.TH	65**
PUZ-M140YKA.TH	73**
PUZ-ZM50VKA2	65**

Table E21139/T3 - Sound Power Levels (Condensers-Cooling Only)

All values are partial free-field

*Sound Power Level measured at 100% capacity and cooling mode only according to manufacturer's data.

**Sound Power Level measured in cooling mode only according to manufacturer's data.

Manufacturer and Model	Sound Power Levels (dB re 10 ⁻¹² W)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
AHU7 Supply Inlet	70	70	77	72	67	64	61	54
AHU7 Extract Outlet	69	68	76	74	75	72	67	60
AHU7 Case Breakout*	58	52	56	45	40	37	33	32

Table E21139/T4 - Air Handling Units

*Breakout sound based on the SRI of the case provided by the manufacturer.

Manufacturer and Model	Sound Power	Sound Power Levels (dB re 10 ⁻¹² W)							
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
BioPure Kitchen Fan Outlet	86	78	94	85	83	80	75	71	67
BioPure Kitchen Fan Breakout**	78	72	74	70	68	63	58	53	48

Table E21139/T5 - Sound Power Levels (Extract Fan)

**Breakout sound based on the SRI of the case provided by the manufacturer.

Assessment

- 5.4 The noise impact from the proposed plant have been assessed at 1m from the façade of the nearest noise sensitive receptors.
- 5.5 As the mechanical plant equipment has the potential to be running for 24hrs a day the worst-case assessment during the night time has been undertaken.
- 5.6 The following table summarises the night time BS 4142:2014 assessment:

Results		Relevant BS4142:2014 Section	Comments
Mechanical plant sound level	Various - as measured on site.	7.1 7.3.1	Taken from the data provided by the client.
Typical background sound level at nearest noise sensitive receiver	L _{A90(15 min)} 31dB	8.1.3 8.3	Taken from the Santec report (this is a minimum background sound level at night time)
Specific sound level at 1m from the window nearest noise sensitive property on residential properties.	L _{Aeq(15 min)} 34dB	7.3.4 7.3.5	Taken from the Cadna model
Acoustic feature correction	0dB	9.2	The condenser units operate continuously and are not tonal or impulsive, so no feature correction is applied.
Rating level: Nearest noise sensitive property on the nearest residential properties.	34dB	9.2	
Excess of rating level over background sound level	+3dB	11	
Uncertainty of the assessment	±3dB	10	This is the uncertainty estimated in ISO 9613-2:1996 for source of receiver heights of less than 5m and receivers that are less than 100m away from the source. Refer to the end of section 5 for a more detailed discussion regarding uncertainty.

Table E21139/T6- BS 4142:2014 Assessment (Night time)

- 5.7 The overall summary of the assessment is as follows:

Time Period	Background Sound Level L _{A90(15 min)}	Predicted Specific Sound Level at Nearest Noise Sensitive Receptor L _{Aeq,T}	Predicted Rating Level at Nearest Noise Sensitive Receptor L _{A,r,T}	Excess of Rating Level over Background Sound Level	Stantec Criteria - Specific Level (Atmospheric Building Services Only) L _{Aeq,T}	Stantec Criteria - Excess of Rating Level over Background Sound Level	Stantec Criteria for Condition 7 Achieved?
Daytime	48dB	34dB	34dB	-14dB	34dB	+5dB	Yes
Night-time	31dB			+3dB	34dB	+5dB	Yes

Table E21139/T7 - Assessment Summary

- 5.8 The difference between the cumulative rating level ($L_{A,r,Tr}$) and the Background Sound Levels ($L_{A90,15mins}$) at the nearest noise sensitive receptor is predicted to be below the assessment criteria of +5dB as defined in the Stantec report.
- 5.9 The specific sound levels from atmospheric building services at the nearest noise sensitive receptor are predicted to be equal to the levels defined in Table 5.6 of the Stantec report.
- 5.10 On this basis, the proposed mechanical plant is considered to comply with Condition 7 with no additional mitigation measures required.

Uncertainty Discussion

- 5.11 As the Cadna model utilises the prediction model from ISO 9613-2:1996, the uncertainty can be estimated using the methodology provided in the ISO standard as follows:

Height, h *)	Distance, d *)	
	$0 < d < 100$ m	$100 \text{ m} < d < 1\,000$ m
$0 < h < 5$ m	± 3 dB	± 3 dB
$5 \text{ m} < h < 30$ m	± 1 dB	± 3 dB
*) h is the mean height of the source and receiver. d is the distance between the source and receiver.		
NOTE — These estimates have been made from situations where there are no effects due to reflection or attenuation due to screening.		

- 5.12 It can be seen that, the uncertainty estimated in ISO 9613-2:1996 for source of receiver heights of less than 5m and receivers that are less than 100m away from the source is ± 3 dB.

6. CONCLUSION

- 6.1 Adnitt Acoustics have undertaken an acoustic assessment in support of the new fixed mechanical plant equipment at Plot 4A Dunsbury Park, Fitzwygram Way, Havant, PO9 4EE.
- 6.2 An assessment of the impact from the mechanical plant equipment is required as part of the Reserved Matters Application, APP/20/00508, Condition 7.
- 6.3 We have been commissioned by Area to undertake an assessment of the proposed fixed mechanical plant equipment only.
- 6.4 This assessment refers to the noise survey results published within the Stantec Noise Impact Assessment Report (ref. 48359/3001 01 Rev. 00, dated July 2020).
- 6.5 The difference between the cumulative rating level ($L_{A,T,r}$) and the Background Sound Levels ($L_{A90,15mins}$) at the nearest noise sensitive receptor is predicted to be below the assessment criteria of +5dB as defined in the Stantec report.
- 6.6 The specific sound levels from atmospheric building services at the nearest noise sensitive receptor are predicted to be equal to the levels defined in Table 5.6 of the Stantec report.
- 6.7 On this basis, the proposed mechanical plant is considered to comply with Condition 7 with no additional mitigation measures required.

Sarah Barnes BA TechIOA

Under Supervision of Juan L. Rioperez BEng(Hons) MSc MIOA

for ADNITT ACOUSTICS

APPENDIX A: GLOSSARY OF ACOUSTIC TERMS

Ambient Noise	The noise climate heard over a period of time due to all normal sources, in the absence of extraneous or atypical sounds. Used to describe noise in the absence of the introduced sound, generally.		
Ambient Noise Level	Describes the average noise level of the ambient noise over a stated period of time, e.g. hourly noise		
	Parameter: A-weighted Continuous Equivalent Sound Pressure Level determined over the time period T.	$L_{eq,T}$ or $L_{Aeq,T}$	
	Expressed in decibels / A-weighted decibels		dB(A) or dB
Decibel scale dB	A linear numbering scale used to define a logarithmic amplitude scale, thereby compressing a wide range of amplitude values to a small set of numbers		
dB(A)	An electronic filter in a sound level meter, which approximates under defined conditions the frequency response of the human ear.		
$L_{Aeq,T}$	The equivalent continuous sound level. The steady dB(A) level which would produce the same A-weighted sound energy over a stated period of time as the measured sound pressure level.		
L_{Amax}	The maximum dB(A) level measured during a survey period.		
L_{A10}	The dB(A) level exceeded for 10% of the survey period, often used as a quantifier of traffic noise level.		
L_{A90}	The dB(A) level exceeded for 90% of the survey period. Used in BS 4142:1997/2014 as being representative of the background noise level.		
Acoustic screening	Physical barrier to sound formed by fence, wall, building or other structure, which has the effect of reducing the sound transmitted.		
Individual Event Noise	The noise of a distinctive event with the varying noise climate, usually a transient activity, such as a vehicle pass-by, aircraft flyover or similar, rather than an isolated impulsive noise.		
Individual Event Noise Level	Describes the highest noise level during the event as measured under particular conditions of time-weighting		
	Parameter: A-weighted Maximum Sound Pressure Level with FAST or SLOW time weighting	$L_{Amax,FAST}$ or $L_{Amax,F}$ $L_{Amax,SLOW}$ or $L_{Amax,S}$	
	Expressed in decibels / A-weighted decibels		dB(A) or dB
Sound Reduction Index R_w	Single number rating used to describe the sound insulation of building elements as defined in BS EN ISO 717 1997.		
Weighted element-normalized level difference $D_{n,e,w}$	Single number rating used to describe the sound insulation of building elements as defined in BS EN ISO 717 1997.		

APPENDIX B: STANTEC NOISE IMPACT ASSESSMENT REPORT



Dunsbury Hill Farm – Plot 4a

Noise Impact Assessment

On behalf of **Portsmouth City Council**

Project Ref: 48359/3001 | Rev: 00 | Date: July 2020

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For and on behalf of Stantec UK Limited				

Revision	Date	Description	Prepared	Reviewed	Approved

This report has been prepared by Stantec UK Limited ('Stantec') on behalf of its client to whom this report is addressed ('Client') in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which Stantec was appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). Stantec accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

Contents

1	Introduction	1
1.1	Background	1
1.2	Objectives	1
1.3	Site Description, Location and Noise Sensitive Receptors	1
2	Planning Policy, Standards and Guidance	3
2.1	Planning Condition B5	3
2.2	Guidance	3
2.3	Proposed Assessment Criteria	4
3	Baseline Environmental Sound Survey	5
3.1	Procedure	5
3.2	Measurement Locations	5
3.3	Meteorological Conditions	6
3.4	Assumptions/Limitations	6
3.5	Environmental Sound Climate	6
4	Environmental Sound Survey Results	7
5	BS 4142:2014 Assessment	8
5.1	Purpose of assessment	8
5.2	Noise Sensitive Receptor	8
5.3	Background Sound Levels	8
5.4	Proposed Site Layout	8
5.5	Calculation Parameters	9
5.6	Calculation Procedure	10
5.7	Acoustic Feature Correction	12
5.8	BS 4142:2014 Assessment	13
5.9	Context and Mitigating Factors	13
5.10	Uncertainty	14
5.11	Assessment Summary	14
6	Conclusion	16

Figures

Figure 1: Site Location Plan	2
Figure 2: Environmental Sound Measurement Location	5

Tables

Table 1.1: Noise Sensitive Receptors	2
Table 2.1: Proposed Criteria - Industrial Noise	4
Table 3.1: Description of Measurement Location	5
Table 3.2: Meteorological Conditions	6
Table 4.1: Summary of Measured Environmental Sound Survey Results – LT1	7
Table 5.1: Typical Background Sound Level	8
Table 5.2: Drawings and Documentations	9
Table 5.3: Noise Levels Associated with Deliveries	10
Table 5.4: Plant Sound Emission Data	11
Table 5.5: Assumed Sound Reduction Performances of Cladding System	12
Table 5.6: BS4142:2014 Assessment Results	13

Appendices

Appendix A	Acoustic Terminology
Appendix B	Instrumentation
Appendix C	Time History Graphs

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1 Introduction

1.1 Background

- 1.1.1 Stantec UK Ltd has been commissioned by Portsmouth City Council to provide a noise impact assessment to support the discharge of Condition B5 associated with the application for Plot 4a of a proposed development at Dunsbury Hill Farm in Havant.
- 1.1.2 The proposed development has been granted outline planning permission by Havant Borough Council, subject to several planning conditions (Ref No. APP/12/00338).
- 1.1.3 This report details the assessment of the existing sound climate at the site and considers mitigation measures relevant to meet the requirements of Planning Condition B5, in relation to protecting the existing residential development from noise associated with industrial sources.
- 1.1.4 An explanation of the acoustic terminology used in this report is included in Appendix A.

1.2 Objectives

- 1.2.1 The objectives of this report are as follows:
 - To establish, by means of a detailed 24-hour daytime and night-time environmental sound survey, the existing environmental sound levels at the closest noise sensitive receptors; and
 - To undertake a noise impact assessment associated with the operation of the proposed development in accordance with BS 4142:2014

1.3 Site Description, Location and Noise Sensitive Receptors

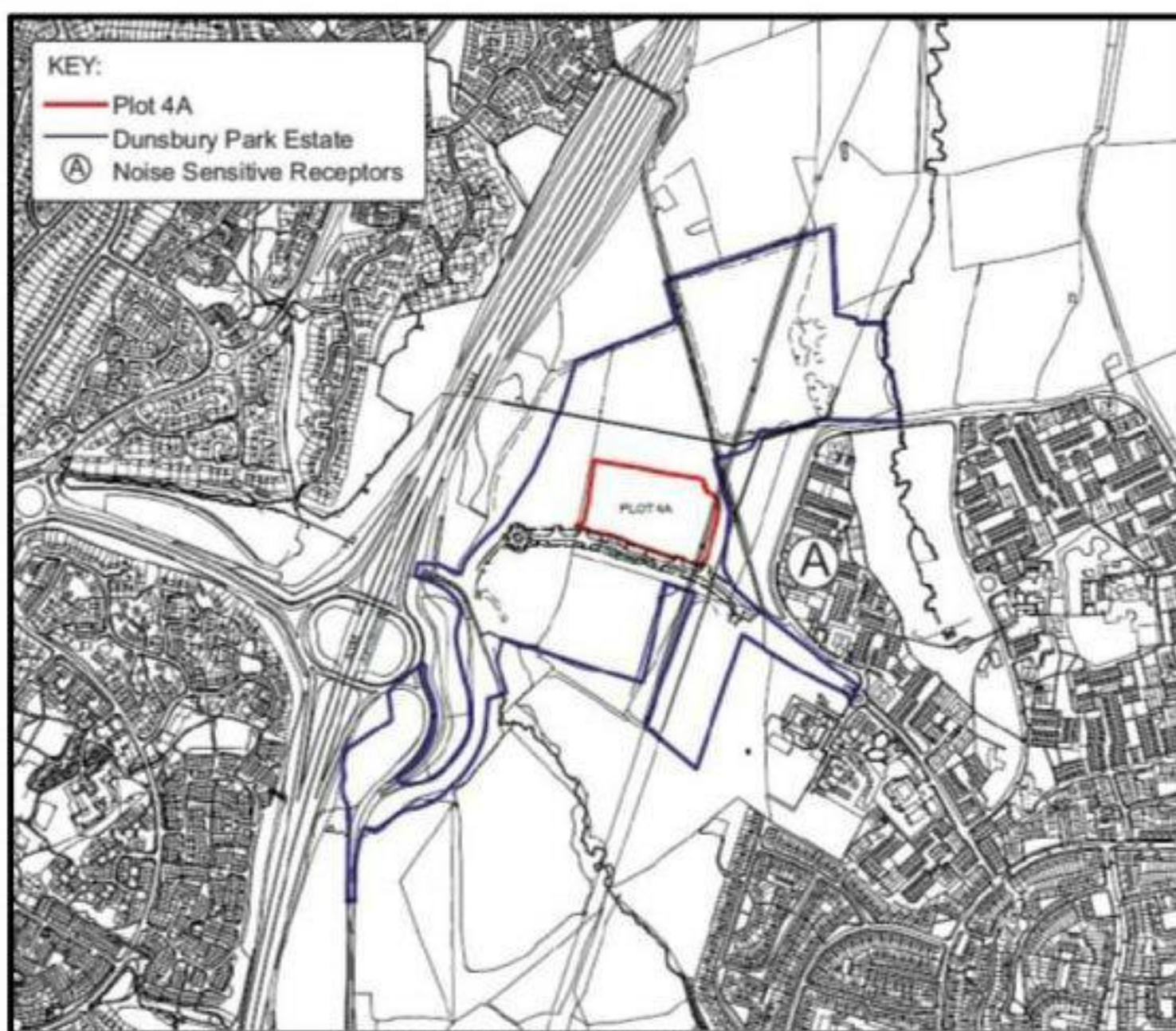
- 1.3.1 The proposed development site is located in the Dunsbury Park Business Site, approximately 3 km to the north west of Havant and falls within the jurisdiction of Havant Borough Council.
- 1.3.2 The site consists of open land. The site is bound by Park Lane and Calshot Road to the east and Fitzwygram Way to the south.
- 1.3.3 The proposal is for approximately 120,000 sq. ft. of B2 manufacturing space (B2 Use Class) on Plot 4a.
- 1.3.4 Receptors are those aspects of the environment sensitive to changes in baseline conditions. The sensitivity of a particular receptor depends upon the extent to which it is susceptible to such changes.
- 1.3.5 Residential receptors (both inside and outside) are considered to have a high sensitivity. Commercial and industrial receptors are considered to have a low sensitivity.
- 1.3.6 **Table 1.1** details the approximate location of the main noise sensitive receptors in proximity to the site. For clarity, individual receptors have been grouped where appropriate however in all cases where there are a number of grouped receptors impacts at the worst-case receptor within the group has been considered.

Table 1.1: Noise Sensitive Receptors

Receptor	Noise Sensitive Receptor	Type of Receptor	Sensitivity of Receptor
A	Properties off Calshot Road to the east of the Site	Residential	High

1.3.7 The location of the site and nearest noise sensitive receptors is detailed in **Figure 1**.

Figure 1: Site Location Plan



Source: Site Location Plan ref DHF-BMD-Z4A-XX-DR-A-10000 rev P01.0 dated 20/02/20 by BAM Design

2 Planning Policy, Standards and Guidance

2.1 Planning Condition B5

- 2.1.1 Condition B5 of the outline planning permission (Ref No. APP/12/00338) states that:

"Application for approval of each reserved matters for new buildings, structures or uses of land pursuant to this permission shall be accompanied by information and plans concerning the following other matters, unless otherwise agreed in writing by Local Planning Authority:

[...]

h. A noise assessment for any development for General Industrial purposes (Class B2) or Storage and Distribution purposes (Class B8)."

2.2 Guidance

British Standard 4142:2014 +A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

- 2.2.1 BS 4142:2014 +A1:2019 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in the standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.
- 2.2.2 The standard is used to determine the rating levels for sources of sound of an industrial and/or commercial nature and the ambient, background and residual sound levels at outdoor locations. These levels could be used for the purposes of investigating complaints; assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and assessing sound at proposed new dwellings or premises used for residential purposes. However, the determination of noise amounting to a nuisance is beyond the scope of the standard.
- 2.2.3 The standard should not be used to assess sound from the passage of vehicles on public roads and railway systems; recreational activities; music and other entertainment; shooting grounds; construction and demolition; domestic animals; people; public address systems for speech and other sources falling within the scopes of other standards or guidance. The standard cannot be applied to the derivation of indoor sound levels arising from sound levels outside, or the assessment of indoor sound levels.
- 2.2.4 The procedure contained in BS 4142 assesses the significance of sound which depends upon the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs/will occur. It is noted that a BS 4142 assessment is reliant on measuring relevant background sound levels.
- 2.2.5 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level and considering the following:
- Typically, the greater this difference, the greater the magnitude of the impact;
 - A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
 - A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and

- 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.

2.2.6 In order to consider the context, BS 4142 advises that the following factors should be considered:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions such as:
 - Façade insulation treatment;
 - Ventilation and/or cooling that will reduce the need to have windows open to provide rapid or purge ventilation; and
 - Acoustic screening.

2.3 Proposed Assessment Criteria

2.3.1 Based on guidance provided within BS 4142:2014+A1 2019, the assessment criteria for industrial noise are proposed below.

Table 2.1: Proposed Criteria - Industrial Noise

Location	Period	Difference between the Rating Level ($L_{A,T,r}$) and the Background Sound Level ($L_{A90,15mins}$)
1 m from nearest noise sensitive premises	24 Hours	+5 dB

3 Baseline Environmental Sound Survey

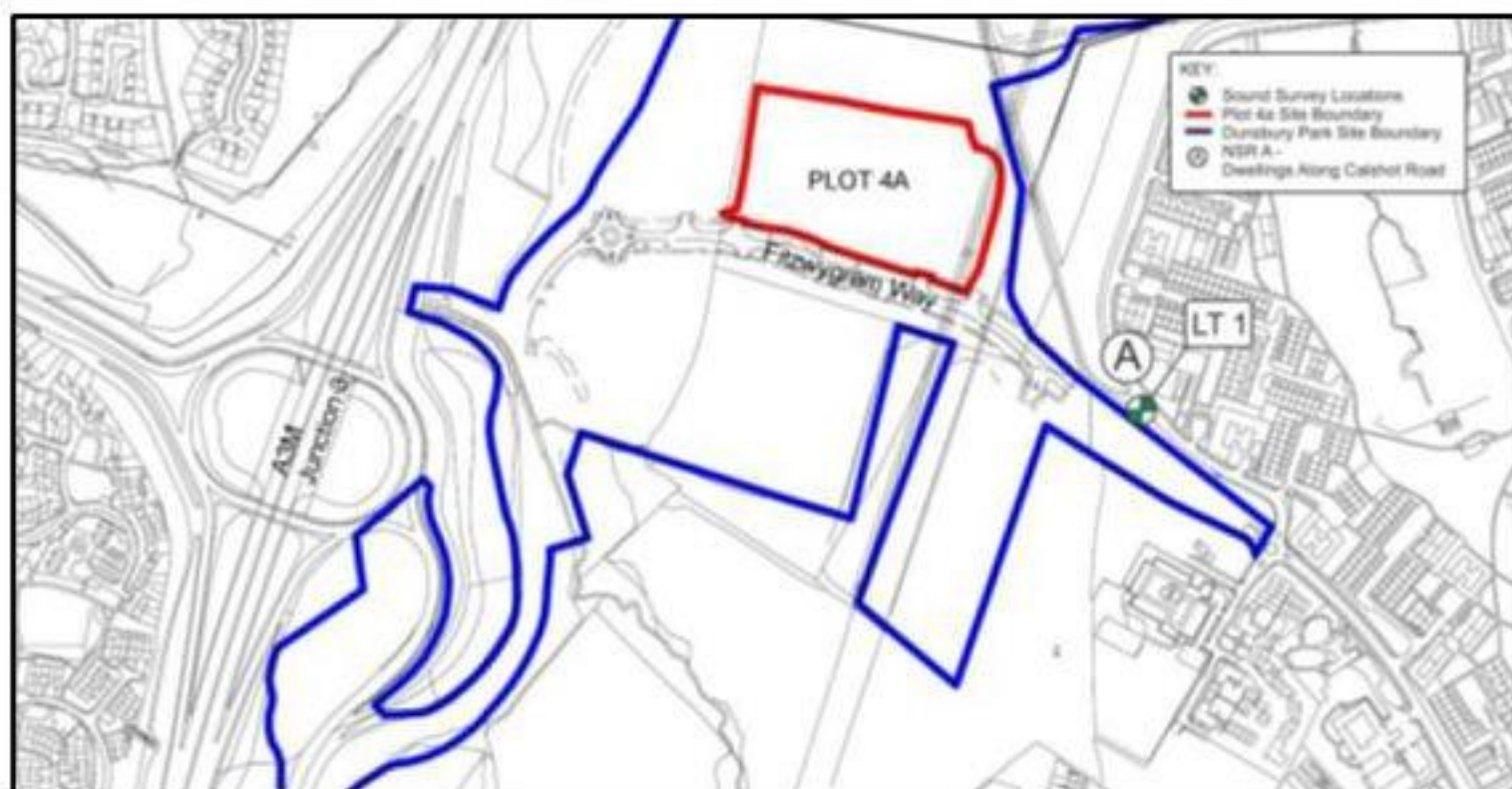
3.1 Procedure

- 3.1.1 An unattended environmental sound survey was undertaken between approximately 08:00 hours on Wednesday 4 March 2020 and approximately 12:00 hours on Thursday 5 March 2020 to determine the existing sound climate at a location considered representative of the nearest noise sensitive receptors located to the east of the site.
- 3.1.2 The survey was undertaken over a typical weekday period. Measurements were made over 15-minute periods of the L_{Aeq} , L_{A90} and L_{AFMax} sound levels.
- 3.1.3 The sound level meter was located in an environmental case. The microphone was connected to the meter via an extension cable and fitted with the manufacturer's windshield.
- 3.1.4 The instrumentation used in the survey (including calibration information) is listed in **Appendix B**.
- 3.1.5 Field calibrations were performed before and after the measurements with no significant fluctuations recorded (< 0.5 dB). Calibration certificates are available upon request.

3.2 Measurement Locations

- 3.2.1 Sound measurements were undertaken at one position at the site. The measurement position is detailed in **Figure 2** and described in **Table 3.1**.

Figure 2: Environmental Sound Measurement Location



Source: Contains Ordnance Survey data © Crown copyright and database right 2020

Table 3.1: Description of Measurement Location

Position	Description
LT1	The microphone was located to the east of the Dunsbury Park Business Park approximately 15 m to the north of Fitzwygram Way and 15 m to the south east of Calshot Road. The microphone was located approximately 45 m to the south of the residential dwellings No. 2-16 Calshot Road. The microphone was at a height of 1.5 m in free field conditions.

3.3 Meteorological Conditions

- 3.3.1 Due to the nature of the survey (i.e. unattended), it is not possible to accurately comment on the meteorological conditions throughout the entire survey period. However, based on a review of publicly available weather forecasts and observations at the beginning and end of the survey period, the weather conditions are detailed in **Table 3.2**.

Table 3.2: Meteorological Conditions

Description	Meteorological Conditions	
	04/03/2020	05/03/2020
Temperature (°C)	6	6
Precipitation (mm)	0	0
Wind Speed (m/s)	< 5	< 5

- 3.3.2 These conditions are considered suitable for obtaining representative sound level measurements.

3.4 Assumptions/Limitations

- 3.4.1 The engineer noticed nothing unusual in terms of the sound climate at the time of the survey. This report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary. No warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

3.5 Environmental Sound Climate

- 3.5.1 Due to the nature of the survey (i.e. unattended), it is not possible to accurately comment on the dominant noise sources or specific noise events during the entire survey period. However, at the beginning and end of the survey period, it was noted that on-site sound levels were dominated by vehicular movements on the surrounding road network, specifically the A3(M) to the west of the site.

4 Environmental Sound Survey Results

- 4.1.1 The results of the survey are presented in the time history graph in **Appendix C**.
- 4.1.2 A summary of the survey results is detailed in **Tables 4.1**.

Table 4.1: Summary of Measured Environmental Sound Survey Results – LT1

Date	Period, T	Measured Sound Level (dB)		
		L _{Aeq,T}	Typical* L _{AFMax}	Typical** L _{A90, T}
04/03/2020 – 05/03/2020	Daytime (07:00 – 23:00 hours)	54	-	48
	Night-time (23:00 – 07:00 hours)	48	66	31

* Based on the 10th highest measured L_{Amax} level.

** Calculated based on the statistical distribution of background sound levels during the measurement period in general accordance with guidance in BS4142:2014.

5 BS 4142:2014 Assessment

5.1 Purpose of assessment

- 5.1.1 An assessment has been undertaken in general accordance with BS 4142:2014 + A1 2019 to determine the likely noise impact associated with the operations of the proposed development on the nearest existing noise sensitive receptors.

5.2 Noise Sensitive Receptor

- 5.2.1 The nearest noise sensitive receptors, identified as Receptor A in **Figure 1**, are located approximately 180 m to the east of the Site.

5.3 Background Sound Levels

- 5.3.1 For the purpose of this assessment background sound levels during the operational periods are derived from the environmental sound survey location LT 1 which is described in Section 4 of this report.
- 5.3.2 The daytime and night-time background sound levels have been calculated for measurement locations LT1 using the statistical analysis method as detailed in BS 4142. **Table 5.1** presents the typical background sound levels.
- 5.3.3 Deliveries during the night-time will only occur between 06:30 hours and 07:00 hours. Therefore, two assessments have been undertaken during the night-time. The first one with the internal and external fixed plant operating 24/7 and the second with the internal and external plant and delivery noise between 06:30 and 07:00.

Table 5.1: Typical Background Sound Level

Period	Comment	Typical LA90, 15 min (dB)
Daytime (07:00 – 23:00)	External and internal plant and delivery plant noise	48
Night-time (23:00 – 06:30)	External and internal plant noise only	31
Night-time – delivery time (06:30 – 07:00)	External and internal plant and delivery plant noise	45

5.4 Proposed Site Layout

- 5.4.1 Our calculations and recommendations are based on the following drawings provided by BAM Design Ltd.

Table 5.2: Drawings and Documentations

Drawing Number	Title	Revision	Date
DHF-BMD-Z4A-00-DR-A-11000	Ground Floor Plan	P01.4	23/01/20
DHF-BMD-Z4A-01-DR-A-11001	First Floor Plan	P01.4	23/01/20
DHF-BMD-Z4A-02-DR-A-11002	Second Floor Plan	P01.4	23/01/20
DHF-BMD-Z4A-XX-DR-A-10000	Site Location Plan	P01.0	28/02/20
DHF-BMD-Z4A-XX-DR-A-12000	GA Elevations	P01.3	23/02/20
DHF-BMD-Z4A-XX-DR-A-12001	Site Elevation	P01.0	18/07/19
DHF-BMD-Z4A-XX-DR-A-17800	External Envelope Materials	P01.0	11/03/20
-	Chaffinch Equipment Location	-	19/05/20

5.5 Calculation Parameters

5.5.1 The following has been assumed:

- The primary proposed operational times are Monday – Friday between 06:30 and 18:30 hours, with 5 HGV movements per hour on average;
- The service yard is located on the eastern side of the building;
- The proposed units will be equipped with loading docks and all loading and unloading activities will happen inside the units;
- External equipment will be located on a concrete pad that runs along the north wall of the building and will be operational 24 hours a day. It will include:
 - 5 x Adiabatic process water coolers; and
 - 5 x Chillers for HVAC system.
- Internal equipment will be located on a mezzanine floor that runs along the internal north wall of the building. The equipment will run 24 hours a day and will include:
 - 25 x Material driers;
 - 5 x Material system vacuum pumps;
 - 4 x Compressors; and
 - 40 x Moulding Machines.
- The main building is to be constructed of a horizontally laid built-up wall cladding system with a lightweight, cladding style roof system.

5.6 Calculation Procedure

- 5.6.1 Calculations have been undertaken of the likely noise levels at the nearest noise sensitive receptor associated with the operation of the site during a worst-case one-hour operation period during the daytime (07:00 – 18:30 hours) and during a worst-case 15-minute period during the night-time period (23:00 – 07:00 hours).
- 5.6.2 Additional calculations of plant noise and delivery noise during the night-time have been undertaken during a worst-case 15-minute period between (06:30 – 07:00 hours). Calculations assume that all plant is in continuous operating for the duration of the assessment period.
- 5.6.3 There will be an average of five HGV movements during the one-hour assessment period during the daytime. For calculation purposes, it is assumed that there will be two HGV movements during the 15-minute assessment period during the night-time (06:30 – 07:00 hours).
- 5.6.4 Noise from the external plant, noise breakout from internal plant and the noise from deliveries have been calculated separately before being combined and compared to the background sound level, in accordance with BS4142.
- 5.6.5 **Table 5.3** details the activities associated with the delivery operations of the site. Unless otherwise stated, sound levels are based on measurements from our in-house database. °

Table 5.3: Noise Levels Associated with Deliveries

Measurement Description	Sound Pressure Level SEL (dB)	Source Level Measurement Distance (metres)
Lorry arriving	82	1
Reversing alarm	94	1
Lorry door slam	83	1
Lorry door slam	83	1
Lorry starting	89	1

- 5.6.6 The manufacturers' sound emission data of plant is detailed in **Error! Reference source not found..**

Table 5.4: Plant Sound Emission Data

Building Services Plant	Manufacturer / Model	Data Type	Manufacturer's Sound Levels (dB) at Octave Band Centre Frequency (Hz)							dB(A)
			63	125	250	500	1000	2000	4000	
Water cooler (external)	Piovan – AFCV290	L _p at 10 m	59	48	51	51	48	47	45	54
Chillers (external)	York – CH3	L _p at 10 m	71	63	57	46	41	36	30	47*
Material drier (internal)	Piovan – HRM 150	L _p at 1 m	-	-	-	-	-	-	-	80
Material system vacuum pumps (internal)	Piovan – F Series 5.5 kw	L _p at 1 m	-	-	-	-	-	-	-	73**
Compressors (internal)	SpiralAir – SPR 8T/10	L _p at 1 m	-	-	-	-	-	-	-	59**
Moulding machines (internal)	Krauss Maffei – PX Series	L _p at 1 m	-	-	-	-	-	-	-	65**

*At 20 °C ambient temperature

**The distance at which this data was measured was not available. For the purposes of our assessment we have assumed that the stated sound pressure level was measured at 1 m. We should be advised if this is incorrect.

- 5.6.7 The main building is to be constructed in a combination of composite & built-up insulated steel cladding, and curtain walling. We understand that the built-up insulated cladding would be similar to Euroclad system incorporating 19/1000 liner sheet, 220 mm Quattro brackets and Quattro bars, 220 mm thick rockwool quilt and 50/1000 halfround HPS200 top sheet.
- 5.6.8 The roof covering would be similar to a Euroclad built-up system. The liner sheet is MW5, 300 mm Quattro brackets and bars, 300 mm Rockwool insulation quilt and Euroclad 32/1000 HPS200 top sheet. Approximately 10% of the roof area will comprise integral polycarbonate rooflights.
- 5.6.9 Manufacturer's test data is not available for the proposed constructions. Test data for similar constructions has therefore been used in the assessment. **Table 5.5** details the assumed sound reduction performance values for each building element based on test data for similar systems.

Table 5.5: Assumed Sound Reduction Performances of Cladding System

Building Element	Description	Sound Reduction Index (R) at Octave Band Centre Frequency (Hz)							R _w
		63	125	250	500	1000	2000	4000	
Wall and roof	Lightweight cladding with mineral wool insulation and steel liner sheet	13	14	29	38	40	45	55	38
Rooflight	polycarbonate rooflights	7	10	13	17	19	19	27	19
Door	Roller door	8	10	13	14	15	15	15	15

5.7 Acoustic Feature Correction

5.7.1 Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound levels and the background sound level. The calculated specific sound level should therefore be modified in accordance with the following guidance as outlined in BS 4142:2014+A1 2019. Due to the type of assessment, the subjective method has been used to determine the type and level of acoustic feature corrections applied to each source.

5.7.2 BS 4142 offers the following guidance on the subjective assessment of acoustic feature corrections.

Tonality

For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0 dB and + 6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to + 9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time... If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

Other Sound Characteristics

Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

5.7.3 The sound emission data suggest that none of the fixed plant will be tonal.

- 5.7.4 Some of the noise sources have the potential to be impulsive (e.g. door slam). However, based on the survey results and the calculated levels at Receptor A, none of the source of noise will be individually distinguishable at Receptor A, 180 m away.
- 5.7.5 Based on the data provided and experience, none of the noise sources will be intermittent or will have other sound characteristics.
- 5.7.6 Therefore, no acoustic feature correction has been applied to the calculations presented in the next section.

5.8 BS 4142:2014 Assessment

- 5.8.1 **Table 5.6** details the results of the BS4142:2014 assessment of the proposed development.

Table 5.6: BS4142:2014 Assessment Results

Description	Operational Periods		
	Daytime (07:00 – 23:00 hours) T = 1 hour	Night-Time (23:00 – 07:00 hours) T = 15mins	Night-Time (06:30 – 07:00 hours) T = 15mins
Calculated Specific Sound Level from Delivery Yard	23	-	28
Calculated Specific Sound Level from Atmospheric Building Services	34	34	34
Calculated Specific Sound Level from Internal Operations	25	25	25
Calculated Rating Sound Level at Receptor A (dB $L_{A,T}$)	35	35	35
Background Sound Level (dB $L_{A90,T}$)	48	31	45
Excess of Rating over Background Sound Level (dB)	-13	+4	-10
Assessment of Impact	Indication of a low impact, depending on the context	Indication of a less than adverse impact, depending on the context	Indication of a low impact, depending on the context

- 5.8.2 The difference between the rating level and the background sound level during both the daytime and the night-time is likely to be below the proposed criteria of +5 dB.

5.9 Context and Mitigating Factors

- 5.9.1 The above assessment details the results of the initial numerical assessment of sound levels at the nearest noise sensitive receptor. It is important to recognise context in the assessment of the likely noise impact on the proposed development site arising from the operation of the proposed development.
- 5.9.2 The following factors should be taken into consideration:
- The absolute sound level;
 - The character and level of the residual and specific sound levels; and
 - The sensitivity of the receptor.

Absolute Sound Levels

- 5.9.3 The calculated specific sound level at the worst affected façade of existing noise sensitive receptors, falls below the relevant criteria in World Health Organisation and BS8233 guidelines with respect to noise levels in external amenity areas. In addition, it is over 10 dB lower than the measured night-time residual sound level of 48 dB $L_{Aeq,8 \text{ hours}}$.

Character and Level of Residual and Specific Sound Levels

- 5.9.4 The proposed unit is part of a wider business park. The activities proposed reflect existing and future permitted activities which take place on site or will take place when the business park is fully operational. The character and level associated with the proposed activities is therefore considered to be similar to the character and level of the permitted activities.

Receptor Sensitivity

- 5.9.5 As presented in **Table 1.1**, Receptor A is a residential receptor with a high sensitivity to the potential noise impact.
- 5.9.6 The residential dwellings are fitted with double glazing windows and the majority of private amenity spaces face away from Dunsbury Park.

5.10 Uncertainty

- 5.10.1 Care has been taken to reduce uncertainty as far as reasonably possible. However, it should be recognised that in any environmental sound survey and assessment process uncertainty exists.

Measured Environmental Sound Levels

- 5.10.2 The assessment relies on the results of the environmental sound survey undertaken by Stantec. Uncertainty in measured background sound levels can occur due to variation in temporary/non-representative meteorological conditions however steps were taken to minimise the risk of meteorological conditions affecting the survey results.

Calculation and Assessment Procedure

- 5.10.3 Uncertainty in the sound power levels used in the assessment can occur due to variations in the sound emissions of the source and the operating conditions under which the source is expected to operate.
- 5.10.4 The assessment undertaken has been based on 24-hour operation and conditions provided to us. However, it should be recognised that there is a degree of uncertainty associated with the exact operating conditions if different from those assumed. Nevertheless, it is considered that the assessment undertaken is suitably robust in determining the likely noise impact of the proposed development.

5.11 Assessment Summary

- 5.11.1 The results of the preliminary assessment indicate that the level of impact associated with the operation of the proposed development during the daytime is likely to be an indication of having a low impact, depending on the context.
- 5.11.2 The results of the preliminary assessment indicate that the level of impact associated with the operation of the proposed development during the night-time is likely to be an indication of having a less than adverse impact, depending on the context.

5.11.3 It is also likely that the criterion would be met during both the daytime and the night-time.

5.11.4 Considering the results of the assessment and the contextual and mitigating factors detailed above, the operation of the proposed facility should be considered acceptable.

6 Conclusion

- 6.1.1 Stantec UK Ltd has been commissioned by Portsmouth City Council to provide a noise impact assessment to support the discharge of Condition B5 associated with the application for Plot 4a of a proposed commercial development at Dunsbury Hill Farm in Havant
- 6.1.2 An unattended environmental sound survey was undertaken between approximately 08:00 hours on Wednesday 4 March 2020 and approximately 12:00 hours on Thursday 5 March 2020 in order to determine the existing sound climate at a location considered representative of the nearest noise sensitive receptors located to the east of the site.
- 6.1.3 Assessment criteria have been proposed based on the requirements of planning Condition B5.
- 6.1.4 An assessment in general accordance with BS4142:2014 has also been undertaken to determine the likely impact associated with the proposed facility at the nearest noise sensitive receptors.
- 6.1.5 The assessment indicates that the operations are likely have a low impact during both the daytime and the night-time, at existing noise sensitive receptors.
- 6.1.6 The criteria detailed herein are likely to be achieved, without the need for specific mitigation measures.

Appendix A Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Daytime	The period 07:00-23:00 hours.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10}(s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound.
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Insertion Loss	Insertion loss is the difference in sound pressure level at a single fixed position before and after a noise control element (e.g. enclosure, barrier etc) is installed.
L_{AE} or SEL	A noise level which, if maintained for a period of 1 second, would cause the same A-weighted sound energy to be received as is actually received from a given noise event.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

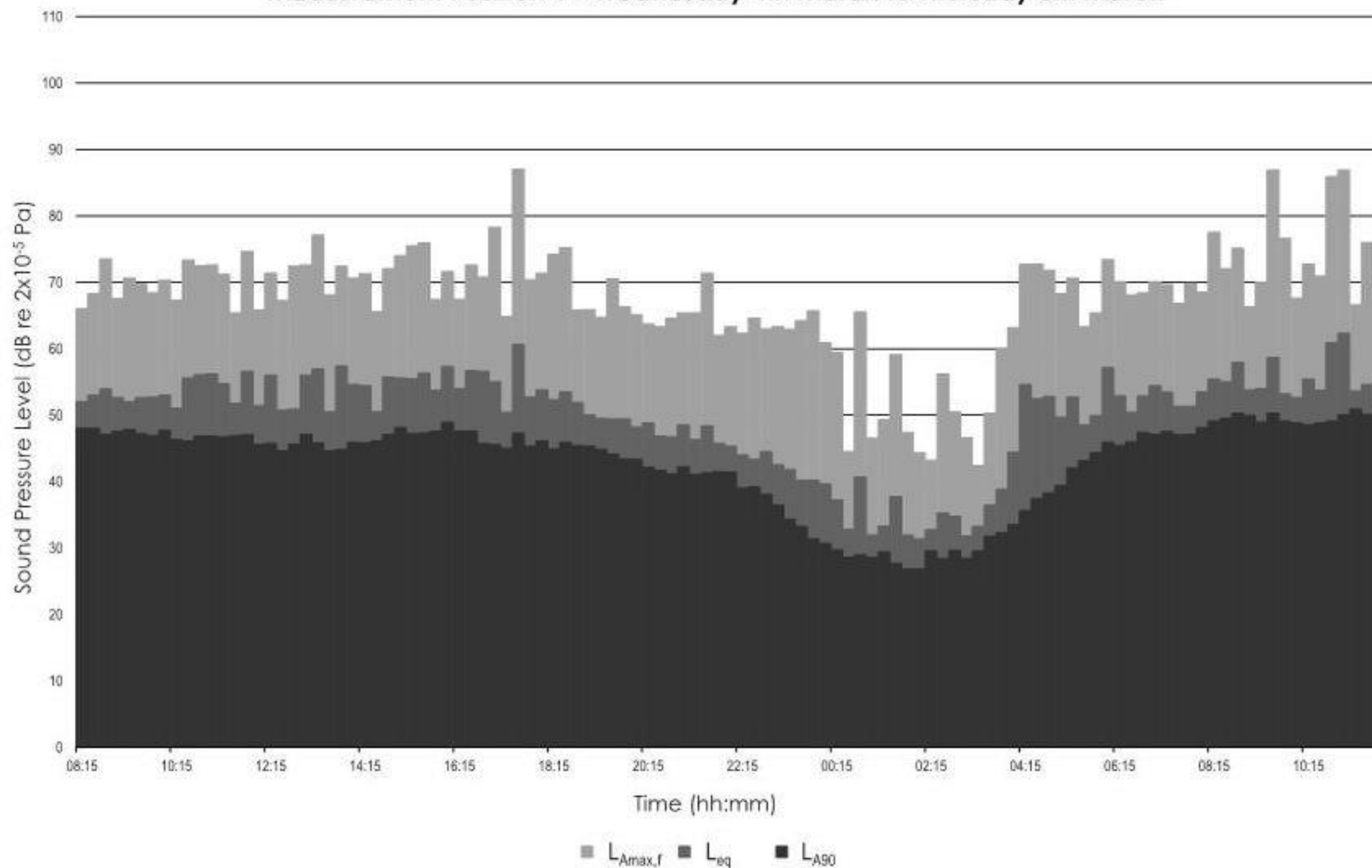
Parameter	Description
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90 % of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
LOAEL	Lowest Observed Adverse Effect Level - the level above which adverse effects on health and quality of life can be detected.
Night-time	The period 23:00-07:00 hours.
NOEL	No Observed Effect Level - 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; and
Noise Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
Rating Noise Level	The specific noise source plus any adjustment for the characteristic features of the noise, denoted by $L_{A,r,T}$.
SOAEL	Significant Observed Adverse Effect Level - The level above which significant adverse effects on health and quality of life occur.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level, L_p	The sound pressure level, L_p is the sound pressure relative to a standard reference pressure of 20 mPa (20×10^{-6} Pascals) on a decibel scale.
Specific Noise Level	The noise source under investigation measured as and $L_{Aeq,T}$

Appendix B Instrumentation

Item	Type	Manufacturer	Serial Number	Laboratory Calibration Date
Sound Calibrator	NC-74	Rion	34746691	30/08/2019
Sound Level Meter	NL-52	Rion	542901	09/01/2020
Microphone	UC-59	Rion	06478	09/01/2020
Pre-Amplifier	NH-25	Rion	42929	09/01/2020

Appendix C Time History Graphs

Dunsbury Hill Farm - Plot 4a
 L_{Aeq} , $L_{Amax,f}$ and L_{A90} Time History
Measurement Position 1 - Wednesday 4th March to Thursday 5th March



APPENDIX C: PROPOSED PLANT NOISE DATA

C.1 Pump motors

Electrical motor features

- **Nominal voltage: 400V / 3ph / 50 Hz - PE**
- Squirrel cage induction motor with two poles in short-circuit with external ventilation closed (TEFC)
- IP55 protection (EN 60034-5)
- Performance according to EN 60034 – 1
- Motor Efficiency IE3 (three phase from 0,75 up to 375 kW)
- 155 (F) isolation level
- Maximum environment working temperature: 40 °C

Other

- Rotation must be anticlockwise by looking at the inlet mouth of aspiration of the pump.
- Counterflanges are not included
- Sound pressure level on the table beside

Power	Sound pressure level LpA
kW	dB
1,1	< 70
1,5	< 70
2,2	< 70
3	< 70
4	< 70
5,5	< 75
7,5	71
11	71
15	71
18,5	73
22	69
30	69
37	69
45	74

The tables below show the mean sound pressure levels (Lp) measured at 1 meter distance in a free field according to EN ISO 11203.

The noise values are measured on 50 Hz motors and have a tolerance of 3 dB (A) according to EN ISO 4871.

Appendix A

BioPure VRF Schedule

Date: 08/12/21

Rev: 03



VRF										
Warehouse Offices Area	Leak Detection Required	Unit Reference	Heat Loss kW	Heat Gain kW	Heat Gain kW	Model	Unit type	Qty	Controller	Notes:
System 1										
CMM METROLOGY	NO	P-00-01	2.51	2.8	3.08	PLFY-M32VEM-E	Cassette	1	1	
FACILITIES OFFICE	YES	P-00-02	3.49	4.06	4.466	PLFY-M40VEM-E	Cassette	1	1	
IT BUILD ROOM	YES	P-00-03	0.96	0.92	1.012	PLFY-P32VEM-E1	Cassette	1	1	
MEETING RM 2	YES	P-00-04	0.46	0.43	0.473	PLFY-P32VEM-E1	Cassette	1	1	
MEETING RM 3	YES	P-00-05	1.12	1.13	1.243	PLFY-P32VEM-E1	Cassette	1	1	
WORKSHOP	YES	P-00-06	2.42	2.59	2.849	PLFY-M32VEM-E	Cassette	1	1	
QUALITY	NO	P-00-07	5.84	6.98	7.678	PLFY-M80VEM-E	Cassette	1	1	
REFLECTION	YES	P-00-08	0.69	0.57	0.627	PLFY-P32VEM-E1	Cassette	1	1	
TEST LAB	NO	P-00-09	2.35	2.61	2.871	PLFY-P32VEM-E1	Cassette	1	1	
TRAINING ROOM 1	YES	P-00-10	1.58	1.63	1.793	PLFY-P32VEM-E1	Cassette	1	1	
TRAINING ROOM 2	YES	P-00-11	1.82	2.07	2.277	PLFY-P32VEM-E1	Cassette	1	1	
		System 1 BC Box				CMB-M1012V-JA1	BC Box	1		
		System 1 Production Office				PURY-M300YNW-A1	Condenser	1		
System 2										
MEDICAL	YES	P-00-12	0.59	0.56	0.616	PLFY-P32VEM-E1	Cassette	1	1	
MEETING RM 4	YES	P-00-13	0.99	0.99	1.089	PLFY-P32VEM-E1	Cassette	1	1	
PRODUCTION CONTROL	NO	P-00-14	4.09	4.93	5.423	PLFY-M50VEM-E	Cassette	1	1	
PRODUCTION CONTROL		P-00-15	4.09	4.93	5.423	PLFY-M50VEM-E	Cassette	2		
		System 2 BC Box				CMB104V-J1	BC Box	1		
		System 2 Production Office				PURY-M200YNW-A1	Condenser	1		

VRF										
Office Area			Heat Loss kW	Heat Gain kW	Heat Gain kW	Model	Unit type	Qty	Controller	Notes:
GF Office - System 3										
CLIENT SPACE	TBD	OF-00-01	2.34	4.51	4.961	PEFY-M50VMA-A	DUCTED	1	1	
RECEPTION	TBD	OF-00-02	5.37	8.04	8.844	PEFY-M80VMA-A	DUCTED	1	1	
						CMB-M108V-JA1	Branch Control Box	1		
						PURY-M300YNW-A1	Condenser	1		
1ST FLOOR OFFICE - System 4										
RM1-02 - 16p Boardroom	TBD	OF-01-01	2.42	4.56	5.016	PEFY-M50VMA-A	DUCTED	1	1	
RM1-04 - MD Office & RM1-05 - 2p MTG room	TBD	OF-01-02	1.04	1.98	2.178	PEFY-M20VMA-A	DUCTED	1	1	
						CMB-M1012V-JA1	Branch Control Box	1		
						PURY-M300YNW-A1	Condenser	1		

Split System										
Area			Heat Loss kW	Heat Gain kW	Heat Gain kW	Model	Unit type	Qty	Controller	Notes:
Tool Stores	TBD	MTS-00-01	12.95	13.59	14.949	PLA-M171EA	Cassette	2	1	
						PUZ-M140YKA-TH	Condenser	1		
Logistics	TBD	L-00-01	4.56	5.97	6.567	PLA-M60EA	Cassette	1	1	
						SUZ-M60VAR2-TH	Condenser	1		
RM1-14 - Comms Room	TBD	OF-01-03/OF-01-04			Slw	PKA-M50LA-TH	wall	2	1	
						PUZ-2M50VKA2	Condenser	2		



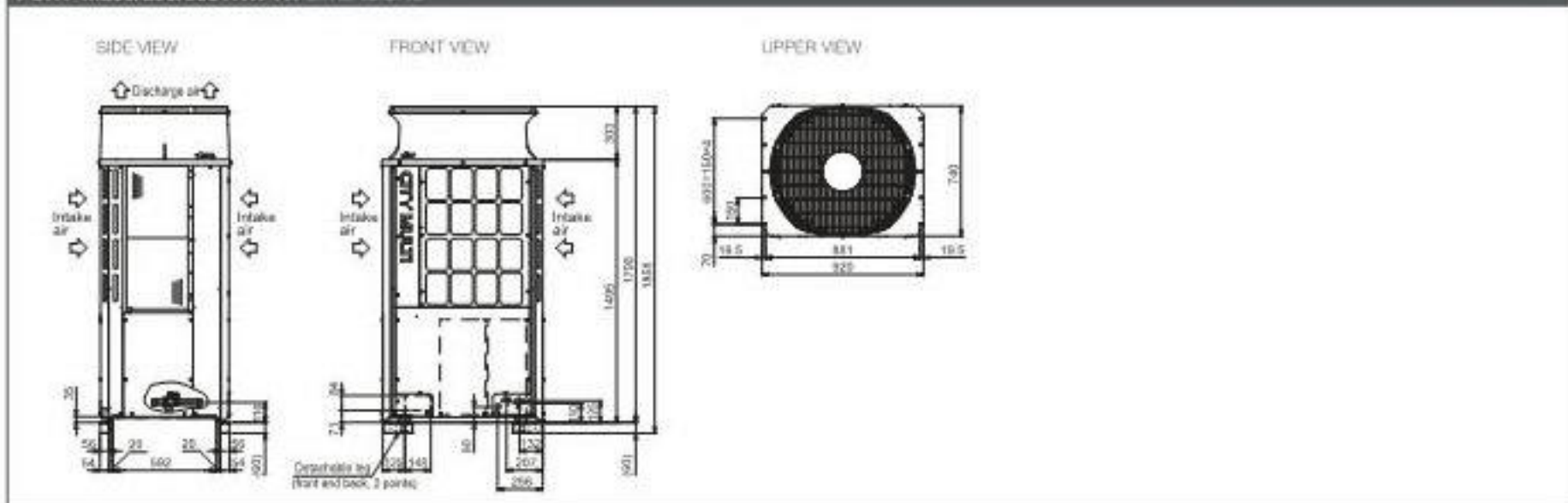
R32

PURY-M-YNW-A1 OUTDOOR UNITS

		PURY-M200YNW-A1	PURY-M250YNW-A1	PURY-M300YNW-A1
CAPACITY (kW)	Heating (nominal)	25.0	31.5	37.5
	Cooling (nominal)	22.4	28.0	33.5
	High Performance Heating (6K)	25.0	31.5	35.8
	ODP Priority Heating (3K)	22.8	28.7	34.1
	Cooling (UK)	20.1	25.1	30.0
POWER INPUT (kW)	Heating (nominal)	5.27	7.32	9.35
	Cooling (nominal)	4.85	7.10	8.67
	High Performance Heating (UK)	6.04	9.22	12.44
	ODP Priority Heating (3K)	5.27	7.32	9.35
	Cooling (UK)	2.81	4.12	5.03
ODP / EER (nominal)		4.74 / 4.61	4.30 / 3.94	4.01 / 3.85
MAX NO. OF CONNECTABLE INDOOR UNITS		9 (8 ¹⁾)	11 (10 ¹)	14 (12 ¹)
MAX CONNECTABLE CAPACITY		50~150% O/U Capacity	50~150% O/U Capacity	50~150% O/U Capacity
AIRFLOW (m³/min)	High	170	185	240
PIPE SIZE mm (in)	Gas	19.05 (3/4")	22.2 (7/8")	22.2 (7/8")
	Liquid	15.88 (5/8")	15.88 (5/8")	15.88 (5/8")
SOUND PRESSURE LEVEL (dBA) @ 1m	Heating / Cooling	59.0 / 59.0	61.0 / 60.5	67.0 / 61.0
SOUND POWER LEVEL (dBA) @ 100% Capacity	Heating / Cooling	78.0 / 76.0	80.0 / 79.5	86.5 / 80.0
WEIGHT (kg)		227	227	227
	Width	920	920	920
	Depth	740	740	740
DIMENSIONS (mm)	Height	1858	1858	1858
	(1738mm without legs)			
ELECTRICAL SUPPLY		380-415V, 50Hz	380-415V, 50Hz	380-415V, 50Hz
PHASE		Three	Three	Three
STARTING CURRENT (A)		8	8	8
NOMINAL SYSTEM RUNNING CURRENT (A)	Heating / Cooling (Max)	8.4 / 7.7 (16.1)	11.7 / 11.3 (22.5)	14.9 / 13.9 (25.6)
GUARANTEED OPERATING RANGE (°C)	Heating / Cooling	-20~15.5 / -5~52	-20~15.5 / -5~52	-20~15.5 / -5~52
FUSE RATING (MCB sizes BS EN 60847-2) - (A)		1 x 20	1 x 25	1 x 32
MAINS CABLE No. Cores		4	4	4
CHARGE REFRIGERANT (kg) / CO ₂ EQUIVALENT (t)	R32 (GWP 675)	5.2 / 3.5	5.2 / 3.5	5.2 / 3.5
MAX ADDITIONAL REFRIGERANT (kg) / CO ₂ EQUIVALENT (t)	R32 (GWP 675)	21.3 / 14.4	22.3 / 15.1	22.8 / 15.4

Notes: *SEER/SCOP available separately in the 'City Multi VRF Seasonal Efficiency' document. Based on Ecodesign Lot 21/6 to EN14825 standard.
¹ If a PERY-M 20 or 25 indoor unit is connected.

PURY-M200/250/300YNW-A1 DIMENSIONS



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Note: This fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP 2088), R32 (GWP 675), R407C (GWP 1774) or R134a (GWP 1430). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No 626/2011 from IPCC 3rd edition, these are as follows: R410A (GWP 1975), R32 (GWP 550), R407C (GWP 1650) or R134a (GWP 1300).

Effective as of November 2019



R32



PCA-M INDOOR UNITS		PCA-M50KA	PCA-M60KA	PCA-M71KA	PCA-M100KA	PCA-M125KA	PCA-M140KA
CAPACITY (kW)	Heating (nominal)	6.0 (1.5-7.2)	7.0 (1.6-8.0)	8.0 (2.0-10.2)	11.2 (2.8-12.5)	13.5 (4.1-15.0)	15.0 (4.2-15.8)
	Cooling (nominal)	5.0 (1.5-5.6)	6.1 (1.6-6.3)	7.1 (2.2-8.1)	9.5 (4.0-10.6)	12.1 (5.7-13.0)	13.4 (5.7-14.1)
	Heating (J/K)	5.10 (1.28-6.12)	5.95 (1.35-6.80)	6.80 (1.70-8.67)	9.63 (2.41-10.75)	11.61 (3.53-12.90)	12.90 (3.61-13.59)
	Cooling (J/K)	4.60 (1.38-5.15)	5.61 (1.47-5.80)	6.53 (1.56-7.45)	8.65 (3.64-9.65)	11.01 (5.19-11.83)	12.19 (5.19-12.83)
SHF (nominal)		0.79	0.81	0.76	0.77	0.72	0.72
COP / EER (nominal)		3.71 / 3.30	4.00 / 3.70	3.61 / 3.60	3.41 / 3.23	3.41 / 3.01	3.50 / 2.50
SCOP (typical) / SEER (typical) (BS EN14825)		4.10 / 6.00	4.10 / 6.40	4.10 / 6.50	4.10 / 6.00	4.1 (162.7%) / 5.2 (213%)	4.0 (158.7%) / 5.1 (208%)
ErP ENERGY EFFICIENCY CLASS	Heating/Cooling	A+ / A+	A+ / A+	A+ / A+	A+ / A+	A+ / A	A+ / A
AIRFLOW (l/s)	Lo-Mid-Hi	167-183-217-250	250-267-283-317	267-283-300-333	367-400-433-467	383-417-450-483	400-433-483-533
PIPE SIZE mm (in)	Gas/Liquid	12.7 (1/2") / 6.35 (1/4")	15.88 (5/8") / 6.35 (1/4")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")
SOUND PRESSURE LEVEL (dBA)	Lo-Mid-Hi	32-34-37-40	33-35-37-40	35-37-39-41	37-39-41-43	39-41-43-45	41-43-45-48
SOUND POWER LEVEL (dBA)		60	60	62	63	65	68
DIMENSIONS (mm)	Width x Depth x Height	990 x 680 x 230	1280 x 680 x 230	1280 x 680 x 230	1600 x 680 x 230	1600 x 680 x 230	1600 x 680 x 230
WEIGHT (kg)		26	32	32	37	38	42
ELECTRICAL SUPPLY		Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit
FUSE RATING (BS88) - HRC (A)		6	6	6	6	6	6
INTERCONNECTING CABLE No. CORES		4	4	4	4	4	4
WIRED REMOTE CONTROLLER REFERENCE		PAR-40MAA	PAR-40MAA	PAR-40MAA	PAR-40MAA	PAR-40MAA	PAR-40MAA
WIRELESS REMOTE CONTROLLER REFERENCE		PAR-SL94B	PAR-SL94B	PAR-SL94B	PAR-SL94B	PAR-SL94B	PAR-SL94B

SUZ-M / PUZ-M OUTDOOR UNITS		SUZ-M50VAR2	SUZ-M60VAR2	SUZ-M71VAR1	PUZ-M100VAR1	PUZ-M125VAR1	PUZ-M140VAR1
SOUND PRESSURE LEVEL (dBA)	Heating/Cooling	48 / 49	49 / 51	49 / 51	51 / 54	54 / 56	55 / 57
	Cooling	64	65	66	70	72	73
WEIGHT (kg)		41	54	55	76	84	84
DIMENSIONS (mm)	Width x Depth x Height	800 x 285 x 714	840 x 330 x 880	840 x 330 x 880	1050 x 330 x 981	1050 x 330 x 981	1050 x 330 x 981
ELECTRICAL SUPPLY		220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz
PHASE		Single	Single	Single	Single	Single	Single
SYSTEM POWER INPUT (kW)	Heating/Cooling (nominal)	1.61 / 1.51	1.75 / 1.64	2.21 / 1.97	3.28 / 2.94	3.95 / 4.01	4.26 / 5.36
	Heating/Cooling (J/K)	1.37 / 1.30	1.49 / 1.41	1.88 / 1.59	2.95 / 2.44	3.56 / 3.33	3.85 / 4.45
STARTING CURRENT (A)		8.0	9.3	9.5	14.2	17.3	23.2
SYSTEM RUNNING CURRENT (A)	Heating/Cooling (MAX)	8.0 / 7.1 (13.5)	9.3 / 8.4 (14.8)	9.5 / 9.1 (14.8)	14.2 / 12.6 (20.0)	17.0 / 17.3 (26.5)	18.4 / 23.2 (30.0)
FUSE RATING (BS88) - HRC (A)		20	20	20	32	32	40
MAINS CABLE No. CORES		3	3	3	3	3	3
MAX PIPE LENGTH (m)		30	30	30	55	65	65
MAX HEIGHT DIFFERENCE (m)		30	30	30	30	30	30
CHARGE REFRIGERANT (kg) / CO ₂ EQUIVALENT (l) - R32 (GWP 675)		1.20 / 0.81 (7m)	1.25 / 0.84 (7m)	1.45 / 0.96 (7m)	3.10 / 2.09 (30m)	3.60 / 2.43 (30m)	3.60 / 2.43 (30m)
MAX ADDITIONAL REFRIGERANT (kg) / CO ₂ EQUIVALENT (l) - R32 (GWP 675)		1.66 / 1.12	1.71 / 1.15	2.37 / 1.80	4.10 / 2.77	5.00 / 3.38	5.00 / 3.38

Note: Duty/standby not available on SUZ-M50/60/71VAR2/1.

PCA-M50KA DIMENSIONS		PCA-M60/71KA DIMENSIONS		PCA-M100/125/140KA DIMENSIONS	
LOWER VIEW	SIDE VIEW	LOWER VIEW	SIDE VIEW	LOWER VIEW	SIDE VIEW
FRONT VIEW		FRONT VIEW		FRONT VIEW	



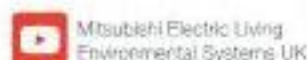
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Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:468), R1234ze (GWP:7) or R1234yf (GWP:4). These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No 626/2011 from IPCC 3rd edition, these are as follows: R410A (GWP:1975), R32 (GWP:660), R407C (GWP:1650) or R134a (GWP:1300).

Effective as of May 2020



Air Conditioning Product Information

PCA-M R32 Ceiling Suspended System Power Inverter Heat Pump (Single Phase)

R32



PCA-M INDOOR UNITS		PCA-M50KA	PCA-M60KA	PCA-M71KA	PCA-M100KA	PCA-M125KA	PCA-M140KA
CAPACITY (kW)	Heating (nominal)	5.5 (2.5-6.6)	7.0 (2.8-8.2)	8.0 (3.5-10.2)	11.2 (4.5-14.0)	14.0 (5.0-16.0)	16.0 (5.7-18.0)
	Cooling (nominal)	5.0 (2.3-5.6)	6.1 (2.7-6.7)	7.1 (3.3-8.1)	9.5 (4.9-11.4)	12.5 (5.5-14.0)	13.4 (6.2-15.0)
	Heating (J/K)	4.7 (2.15-5.6)	5.95 (2.4-6.95)	6.8 (3.0-8.66)	9.5 (3.85-11.3)	11.9 (4.25-13.9)	13.6 (4.85-15.3)
	Cooling (J/K)	4.6 (2.1-5.15)	5.5 (2.5-6.15)	6.55 (3.05-7.45)	9.2 (4.5-10.5)	11.5 (5.05-12.9)	12.9 (5.7-13.8)
SHF (nominal)		0.79	0.81	0.76	0.77	0.72	0.72
COP / EER (nominal)		4.04 / 4.00	4.01 / 4.01	3.71 / 3.88	3.71 / 4.10	3.54 / 3.25	3.51 / 3.40
SCOP (ηsh) / SEER (ηsc) (BS EN14825)		4.2 / 6.7	4.1 / 6.5	4.2 / 6.7	4.3 / 6.4	4.3 (168.8%) / 6.2 (251.0%)	4.4 (173.5%) / 6.2 (248.9%)
ErP ENERGY EFFICIENCY CLASS	Heating/Cooling	A+ / A++	A+ / A++	A+ / A++	A+ / A++	A+ / A++	A+ / A++
AIRFLOW (l/s)	Lo-Mid-Hi	167-183-217-250	250-267-283-317	267-283-300-333	367-400-433-467	383-417-450-483	400-433-483-533
PIPE SIZE mm (in)	Gas / Liquid	12.7 (1/2") / 6.35 (1/4")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")	15.88 (5/8") / 9.52 (3/8")
SOUND PRESSURE LEVEL (dBA)	Lo-Mid-Hi	32-34-37-40	33-35-37-40	35-37-39-41	37-39-41-43	39-41-43-45	41-43-45-48
SOUND POWER LEVEL (dBA)		60	60	62	63	65	68
DIMENSIONS (mm)	Width x Depth x Height	960 x 680 x 230	1280 x 680 x 230	1280 x 680 x 230	1600 x 680 x 230	1600 x 680 x 230	1600 x 680 x 230
WEIGHT (kg)		26	32	32	37	38	40
ELECTRICAL SUPPLY		Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit	Fed by Outdoor Unit
FUSE RATING (BS888) - HRC (A)		6	6	6	6	6	6
INTERCONNECTING CABLE No. CORES		4	4	4	4	4	4
WIRED REMOTE CONTROLLER REFERENCE		PAR-40MAA	PAR-40MAA	PAR-40MAA	PAR-40MAA	PAR-40MAA	PAR-40MAA
WIRELESS REMOTE CONTROLLER REFERENCE		PAR-SL94B	PAR-SL94B	PAR-SL94B	PAR-SL94B	PAR-SL94B	PAR-SL94B

PUZ-ZM OUTDOOR UNITS		PUZ-ZM50VKA	PUZ-ZM60VHA	PUZ-ZM71VHAR1	PUZ-ZM100VKAR1	PUZ-ZM125VKAR2	PUZ-ZM140VKAR2
SOUND PRESSURE LEVEL (dBA)	Heating/Cooling	46 / 44	49 / 47	49 / 47	51 / 49	52 / 50	52 / 50
SOUND POWER LEVEL (dBA)	Cooling	65	67	67	69	70	70
WEIGHT (kg)		48	70	70	116	116	116
DIMENSIONS (mm)	Width x Depth x Height	809 x 380 x 630	950 x 330 + 25 x 943	950 x 330 + 25 x 943	1050 x 330 + 40 x 1338	1050 x 330 + 40 x 1338	1050 x 330 + 40 x 1338
ELECTRICAL SUPPLY		220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz	220-240V, 50Hz
PHASE		Single	Single	Single	Single	Single	Single
SYSTEM POWER INPUT (kW)	Heating/Cooling (nominal)	1.361 / 1.25	1.745 / 1.521	2.156 / 1.829	3.018 / 2.317	3.954 / 3.845	4.432 / 3.941
	Heating/Cooling (J/K)	1.21 / 1.06	1.55 / 1.29	1.92 / 1.55	2.41 / 1.99	3.51 / 3.26	3.94 / 3.35
STARTING CURRENT (A)		5.0	6.0	6.0	13.0	13.0	13.0
SYSTEM RUNNING CURRENT (A)	Heating/Cooling (MAX)	5.95 / 5.37 [13.4]	7.43 / 6.48 [19.4]	9.23 / 7.81 [19.4]	12.97 / 9.97 [27.2]	16.87 / 16.46 [27.3]	18.76 / 18.66 [28.9]
FUSE RATING (BS888) - HRC (A)		16	25	25	32	32	40
MAINS CABLE No. CORES		3	3	3	3	3	3
MAX PIPE LENGTH (m)		50	55	55	100	100	100
MAX HEIGHT DIFFERENCE (m)		30	30	30	30	30	30
CHARGE REFRIGERANT (kg) / CO ₂ EQUIVALENT (g) - R32 (GWP 675) - 30m		2.00 / 1.35	2.80 / 1.89	2.80 / 1.89	4.00 / 2.70	4.00 / 2.70	4.00 / 2.70
MAX ADDITIONAL REFRIGERANT (kg) / CO ₂ EQUIVALENT (g) - R32 (GWP 675)		0.30 / 0.20	0.80 / 0.54	0.80 / 0.54	2.80 / 1.89	2.80 / 1.89	2.80 / 1.89

PCA-M50KA DIMENSIONS		PCA-M60/71KA DIMENSIONS		PCA-M100/125/140KA DIMENSIONS	
LOWER VIEW	SIDE VIEW	LOWER VIEW	SIDE VIEW	LOWER VIEW	SIDE VIEW
FRONT VIEW		FRONT VIEW		FRONT VIEW	



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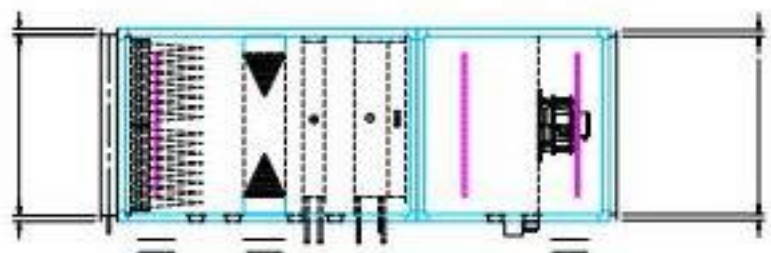
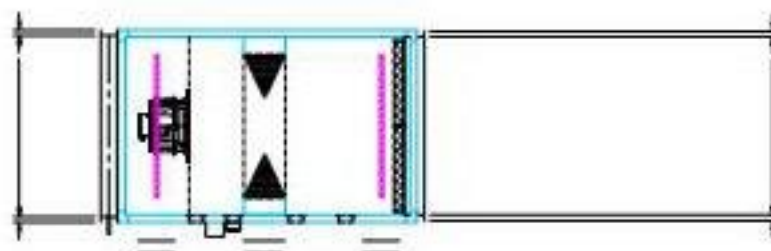
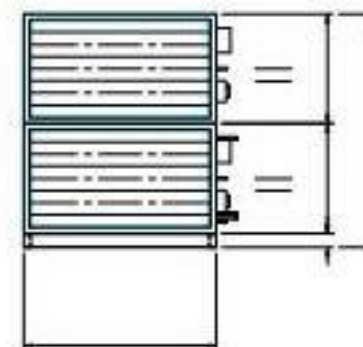
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Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:468), R1234ze (GWP:7) or R1234yf (GWP:4). These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No 626/2011 from IPCC 3rd edition, these are as follows: R410A (GWP:1975), R32 (GWP:660), R407C (GWP:1650) or R134a (GWP:1300).

Effective as of May 2020





*** BEFORE INSTALLATION ***

CHILDREN (2012):
 Adult literacy is viewed as a contributor of better outcomes (e.g., more beneficial health care).
 Literacy skills are necessary for various aspects relating to the poor: those lacking literacy capabilities have more difficulties in their employment and are less healthy. Skills such as literacy contribute to various of tomorrow's most important societal issues such as health care, education, and employment.
 Literacy is viewed as a means to strengthen individual literacy skills and abilities, which facilitates their development and use. Adult literacy programs can help improve the quality of life of people and contribute to the

THESE ARE THE TERMS AND CONDITIONS OF THE SALE OF THE GOODS AND SERVICES OFFERED BY THE COMPANY TO THE CUSTOMER. THE CUSTOMER'S ACCEPTANCE OF THESE TERMS AND CONDITIONS SHALL BE DEEMED TO BE AN AGREEMENT TO THE SALE OF THE GOODS AND SERVICES OFFERED BY THE COMPANY TO THE CUSTOMER. THE CUSTOMER'S ACCEPTANCE OF THESE TERMS AND CONDITIONS SHALL BE DEEMED TO BE AN AGREEMENT TO THE SALE OF THE GOODS AND SERVICES OFFERED BY THE COMPANY TO THE CUSTOMER.

[illegible]

DRAWING NOTES

★ AIR HANDLING UNIT DETAILS

UNIT 1: THE HISTORY OF THE UNITED STATES			
DATE	NAME	SCORE	TEACHER
10/1/2023	John Doe	85	Mr. Smith
10/2/2023	Jane Smith	78	Mr. Smith
10/3/2023	Mike Johnson	92	Mr. Smith
10/4/2023	Sarah Brown	88	Mr. Smith
10/5/2023	David Wilson	75	Mr. Smith
10/6/2023	Emily Davis	82	Mr. Smith
10/7/2023	Chris Miller	79	Mr. Smith
10/8/2023	Alexander Lee	86	Mr. Smith
10/9/2023	Olivia White	77	Mr. Smith
10/10/2023	Benjamin Green	83	Mr. Smith
10/11/2023	Mia Black	76	Mr. Smith
10/12/2023	Lucas Brown	81	Mr. Smith
10/13/2023	Charlotte Gray	74	Mr. Smith
10/14/2023	James White	87	Mr. Smith
10/15/2023	Isabella Black	73	Mr. Smith
10/16/2023	Ethan Brown	84	Mr. Smith
10/17/2023	Ava White	72	Mr. Smith
10/18/2023	Noah Black	80	Mr. Smith
10/19/2023	Grace Brown	71	Mr. Smith
10/20/2023	Henry White	89	Mr. Smith
10/21/2023	Lily Black	70	Mr. Smith
10/22/2023	Robert Brown	85	Mr. Smith
10/23/2023	Sophia White	69	Mr. Smith
10/24/2023	William Black	82	Mr. Smith
10/25/2023	Olivia Brown	68	Mr. Smith
10/26/2023	James White	81	Mr. Smith
10/27/2023	Emily Black	67	Mr. Smith
10/28/2023	Michael Brown	80	Mr. Smith
10/29/2023	Charlotte White	66	Mr. Smith
10/30/2023	David Black	79	Mr. Smith
10/31/2023	Alexander Brown	65	Mr. Smith

[illegible][illegible][illegible]

ece⁺ air handling
and conditioning



Standard Report AQUACIAT^{POWER} LD 1800R

Prepared By: David Tennant

Project: Havant Chillers

Date: 09/29/21 15:44

Seasonal Efficiency (3)

Allowed applications for CE mark:

Comfort Cooling : T ₂ 2°C*	SEER 12M°C η _p cool	5.37 212
Comfort Cooling : T ₂ 13°C*	SEER 22M°C η _p cool	6.21 245
High Temp. Process Cooling : T ₂ 2°C*	SEPR 12M°C	6.33

* ECODSIGN Compliant per (EU) N°2016/2281

R-32

(3) All data related to seasonal efficiency are given for standard units and main options (Brine, pump, energy efficiency,...).

Operating Conditions

System element		Cooling
Fluid	Fluid Type	Fresh Water
	Fouling Factor (sqm-K)/kW	0
	Leaving Temperature °C	6.0
	Entering Temperature °C	12.0
	Fluid Flow l/s	18.0
Hydraulic Module	External Static Pressure kPa	218
	Pump Power Input kW	6.86
Air	Entering Air Temperature °C	35.0
Altitude	m	0

Unit Information

Refrigerant Type		R32
Refrigerant Weight	kg	44
Tonnes CO2 Equivalent	Tonnes	30
Number of Refrigerant Circuit		2
Number Of Compressor		7
Number Of Fan		7
Fan Power Input	kW	4.88
Fan Speed	RPM	720
Fan Air Flow	l/s	27013
Operating / Shipping Weight	kg	3163/3111
Unit Dimensions (LxWxH)	mm	4798x2253x2324

Unit Option

HP VSD dual-pump hydraulic module
Bacnet over IP
Ultra low noise level
Circuit Soft Starter
MCHE anti-corrosion protection Protect2
Anti-vibration mounts (kit)
Exchangers water filter (kit)
Exchanger & hydraulic frost protection
Master/slave operation
Commodity Surcharge



aquaciat^{POWER} R-32

Performance

Mode		Cooling
Cooling Capacity (1)	kW	455
Cooling Efficiency (EER) (1)	kW/kW	2.97
Unit Power Input (1)	kW	153
Sound Power Level (LwA) (1)	dB(A)	87
Sound Pressure Level at 10.0 m (LpA) (1)	dB(A)	55
Minimum Capacity (2)	kW	73.1
Maximum Capacity	kW	455

(1) All performances are compliant with EN14511 – 3 : 2018. Sound power level according to ISO9614 – 1.

(2) Due to the minimum flow rate allowable, a lower inlet water temperature might have to be specified to achieve this performance.

Electric Data

Unit Voltage	V-Ph-Hz	400-3-50
Standby Power	kW	0.453
Power Factor		0.839
Electrical Circuit		Supply 1
Maximum Current	A	358
Start Up Current	A	519

Documentation



Technical Description



Acoustic Sound Power Level Radiated

Sound Power at Chiller Acoustic Center (dB)

Load (%)	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Global sound power(dB)	A-Weighted Global sound power (dB(A))
Max	86	83	84	86	82	80	72	68	92	87

Estimated Sound Power levels - dB re: 1 picowatt

Sound Power level L_w in accordance with ISO 9614-1. Only the Total Sound Power level L_w is certified by Eurovent, at Full Load in cooling mode, with all fans and pumps running at nominal speed, and for inlet air temperature at the condenser between 30°C and 35°C. The sound levels by octave band are guideline values only and not contractually binding.

Acoustic Sound Pressure Level Radiated

Sound Pressure in free field at 10.0 m (dB)

Load (%)	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Global sound pressure(dB)	A-Weighted Global sound pressure (dB(A))
Max	53	50	52	53	50	47	40	35	59	55

Estimated Sound Pressure levels - dB re: 20 micropascal

Estimated average sound pressure L_p at a given distance on a reflective surface in a free field environment.



BioPure - Kitchen Fans

Client:

S&P UK VENTILATION SYSTEMS LTD - Wentworth Road, Ransomes
Europark, Ipswich, Suffolk, IP3 9SW, United Kingdom / tel: 08454
700 074 Fax: 08454 700 075 / www.solerpalau.co.uk/
sales.uk@solerpalau.com

Soler&Palau 
Ventilation Group



Project: BioPure - Kitchen Fans

Date: 21/10/2021 16:52:27

Updated: 21/10/2021 17:06:56

Rev: 1 (2)

Printed by: 0

Telephone:

Mobile:

Fax:

Email:

Telephone:

Mobile:

Fax:

Email:

ENQUIRY

Pos.	Product Ref.	Prod. Code	Desc.	Qty	Volume	Pressure
1	Kitchen Extract	5148518900	KABT/4-6000/450 1,1KW 230/400V VE	1	0,874 m ³ /s	578 Pa
1,1		L1000000662	S&P VFD-M 10A IPS4 (1-PH)(x1)	1		
1,2		5130861700	KSE-45(x1)	1		
1,3		5138921200	ACOPEL F400-450/160 N(x1)	1		
1,4		5402075600	ACOP RECT KABT-6000 N IMPROVED(x1)	1		



KABB/KABT

5148518900 - KABT/4-6000/450 1,1KW 230/400V VE - ACOUSTIC CABINET FANS



Cabinet fans manufactured from galvanised steel sheet with double thickness side panels internally lined with 25 mm thickness of fireproof fibreglass acoustic insulation (M0). Circular duct connection flange on the inlet. KABT incorporates direct drive backward curved centrifugal impeller with motor fitted outside of the air stream, suitable for air stream temperature up to 100°C. Three phase motor IP55, F. Motors 4 pole. Electrical supply: 3-230/400V-50Hz speedcontrollable by inverter. Working temperature from -20°C to 100°C. TradeSoler_Palau model KABT/4-6000/450 1,1KW 230/400V VE for a airflow 0,874 m³/s and static pressure 578 Pa.

Project: BioPure - Kitchen Fans (rev. 1 (2)) - Reference: Kitchen Extract

Theoretical Working Point

Airflow	0,680 m³/s
Static Pressure	350 Pa
Temperature	20 °C
Altitude	0 m
Density	1,2 kg/m³
Frequency	50 Hz

Working Point

Airflow	0,874 m³/s
Static Pressure	578 Pa
Dynamic pressure	29,6 Pa
Total Pressure	608 Pa
Input power	1,03 kW
Outlet speed	7 m/s
Fan speed	1493 rpm
Specific Fan Power	1,18 W/l/s
Specific Fan Power reg	0,81 W/l/s

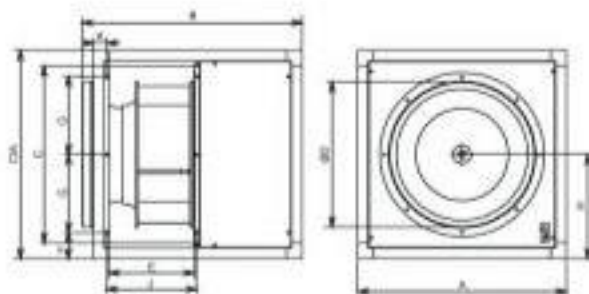
Construction

Discharge diameter	450 mm
Fan size	450
Weight	59,00 kg

Motor Characteristics

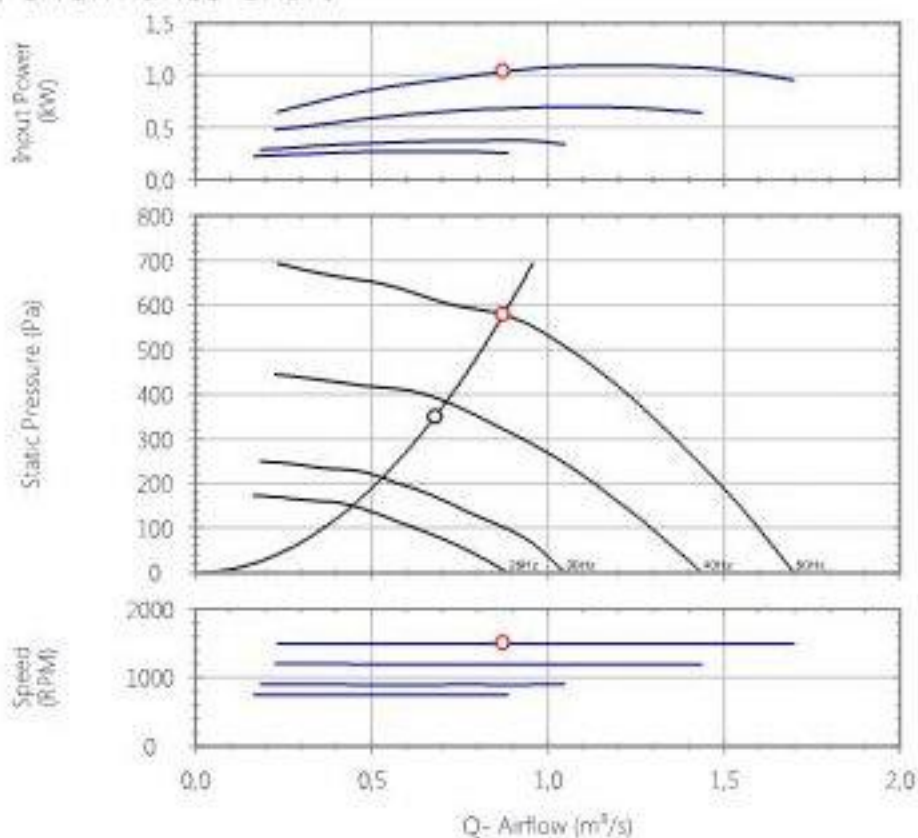
Number of poles	4
Voltage	3-230/400V-50Hz
Maximum absorbed current	4,3 A / 2,5 A
IP Rating	IP55
Motor insulation class	F

Drawing



A	B	C	D	E	F	G	H	J
630	673	530	450	248	100	215	315	269
K								
40								

Performance Chart



Sound Performance

	63	125	250	500	1k	2k	4k	8k	Overall
Inlet (LwA)	54	73	74	76	75	76	73	67	83
Inlet LpA @ 3m	33	53	54	55	55	56	53	46	62
Outlet (LwA)	52	78	76	80	80	76	72	66	86
Outlet LpA @ 3m	32	58	56	60	60	56	52	45	65
Breakout (LwA)	46	58	62	65	63	59	54	47	69
Breakout LpA @ 3m	26	37	42	45	43	38	33	27	49



KABB/KABT

5148518900 - KABT/4-6000/450 1,1KW 230/400V VE - ACOUSTIC CABINET FANS

Project: BioPure - Kitchen Fans (rev. 1 (2)) - Reference: Kitchen Extract

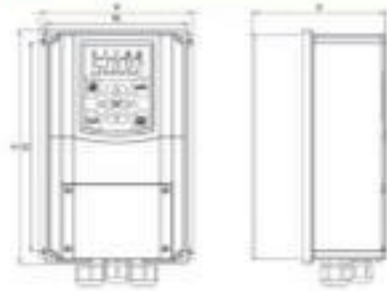
Accessories

L1000000662 - S&P VFD-M 10A IP54 (1-PH)



Single-phase 230V-50/60Hz Voltage supply. Motor kW protection programmable by a single parameter. Power on and drive status indication. Speed selection with UP/DOWN keys. Run/Fault relay output contacts. Motor overload and shortcut protections.

Dimensions



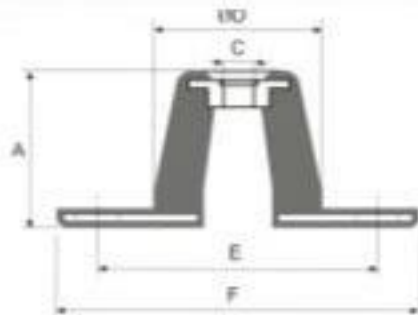
H	H1	W	W1	D	d
193	170	150	140	131	45

5130861700 - KSE-45



Rubber anti-vibration mounts that absorb vibration and attenuate the noise produced in the installation. (1 KSE = 4 supports in a bag)

Dimensions



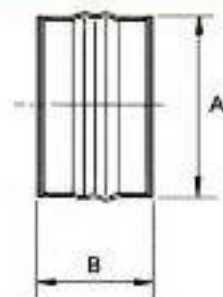
A	C	D	E	F
24	8	30	65	90

5138921200 - ACOPEL F400-450/160 N

FLEXIBLE CONNECTOR



Dimensions



A	B
458	160



KABB/KABT

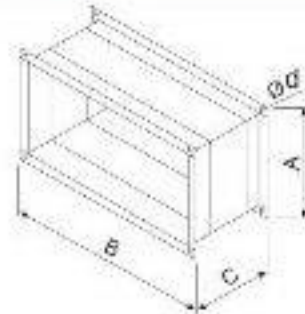
5148518900 - KABT/4-6000/450 1,1KW 230/400V VE - ACOUSTIC CABINET FANS

Project: BioPure - Kitchen Fans (rev. 1 (2)) - Reference: Kitchen Extract

5402075600 - ACOP RECT KABT-6000 N IMPROVED



Dimensions



A	B	C	d
285	566	143	9



KABB/KABT

5148518900 - KABT/4-6000/450 1,1KW 230/400V VE - ACOUSTIC CABINET FANS

Project: BioPure - Kitchen Fans (rev. 1 (2)) - Reference: Kitchen Extract

ErP Data

Ecodesign	
Commission regulation (EU) N°1253/2014 of July 2014	
Information requirements (Annex V)	
Product description	KABT/4-6000/450 1,1KW 230/400V VE
Manufacturer's Info	S&P
Identifier	-
Typology	NRVU unidirectional
Drive	VSD
Type of HRC	None
Thermal efficiency (%)	NA
Qnom (m3/s)	0.91
Pelec (kW)	1.35
SFPint (W/m3/s)	NA
Face velocity (m/s)	6
Δps,ext (Pa)	692
Δps,int (Pa)	NA
Δps,add (Pa)	NA
Static efficiency fans (%)	52.1
External leakage rate (%)	3
Internal leakage rate (%)	NA
Filter performance	NA
Filter warning	NA
LWA dB(A)	71
https://www.solerpalau.com/	

Warnings

This dimensional drawing may not match with the selected product, especially in the discharge orientation

DESCRIPTION	UNIT	AFCV290 SPEC
Cooling capacity	kWth	288,5
Speed	%	90
Input power	kWel	12,60
Water Flow Rate	m ³ /h	53
Water Pressure Drop	kPa	49,2
Air temperature	°C	27
Relative humidity	%	51
Height on the sea level	m	0
Evaporated water ⁽¹⁾	l/h	526,6
Max. required water ⁽²⁾	l/h	3225,6
Inlet water temp.	°C	30
Outlet water temp.	°C	25
Glycol	%	25
Air flow	m ³ /h	153488
Fans/Diam.	n°/mm	6 / 910
Fan input power (each)	kW	2,10
Lenght	mm	8160
Height	mm	1790
Width	mm	1180
Empty Weight	kg	1414
Internal Volume	dm ³	160
Sound Power ⁽³⁾	dB(A)	86
Sound Pressure ⁽⁴⁾	dB(A)	53,7
Energy Class		D
Electrical Supply	V/Ph/Hz	400V/3Ph/50Hz
F.L.I.	kW	12,60
F.L.A.	A	19,20
Water connections	DN	4x80

⁽¹⁾ Water flow rate for adiabatic saturation.
⁽²⁾ Required water flow rate for piping sizing.
⁽³⁾ Power and sound pressure compliant with Standard EN 13487.
⁽⁴⁾ N.B.: the sound pressure level at 10m of distance is calculated in free field conditions, therefore it is merely indicative as it will be affected by the characteristics of the area where it is installed.

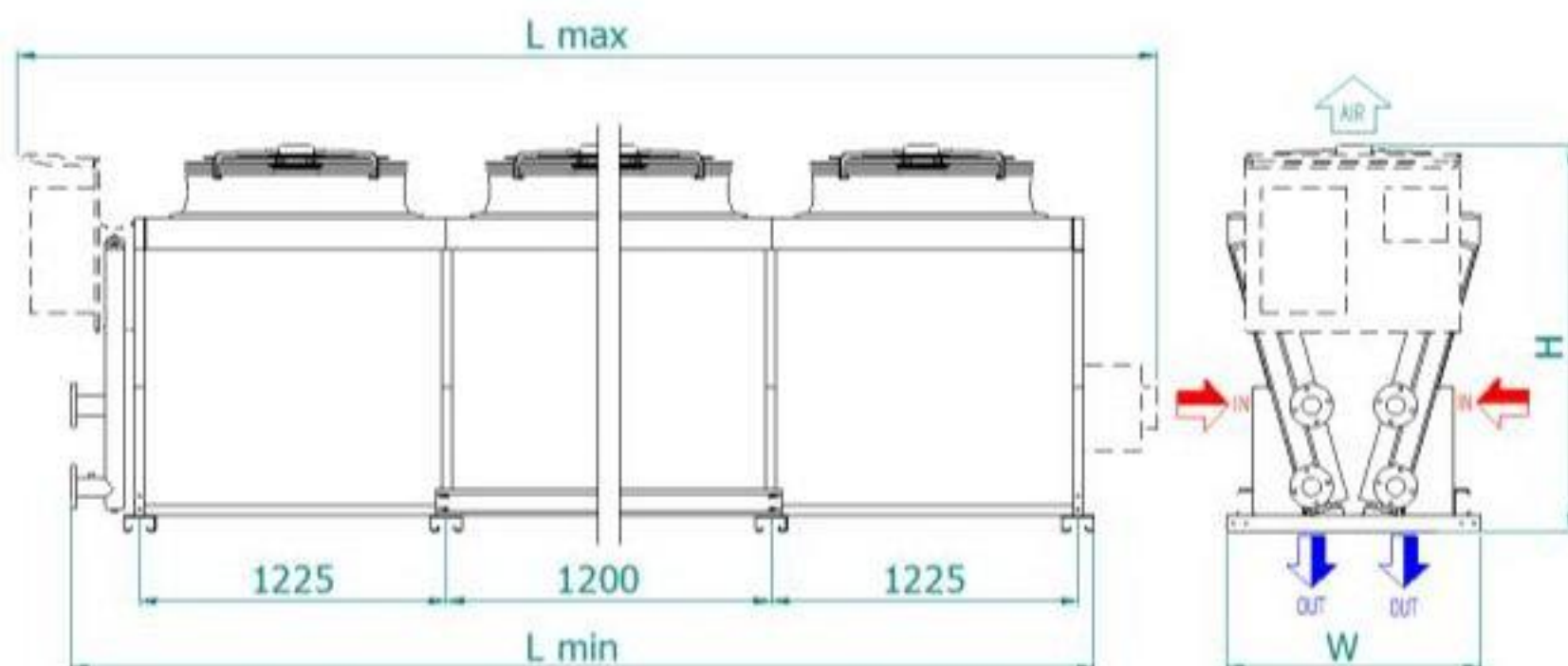
Fitted with a hot-dip galvanized IPE steel strengthener beam (S235JRH). (S.R.S. - Strain Relief System). The fairing is made of hot-dip galvanized steel. Epoxy powder coating (standard colour: RAL 9002) suitable for medium corrosive environments classified C3 (in accordance with EN 12944-2). Air cooled condenser with aluminium fins and copper tubes. The pressure vessel is designed for a PS = 10 bar and a TS = 110 °C in accordance with EC Pressure Equipment Directive 2014/68/EU. EC (electronically commutated) fan motors. Protective grid compliant with EN ISO 13857. 3-phase input. Insulation class F; IP54 degree of protection (EN 60529). Anti-vibration mounts, bolted down to load-bearing surface. Control device designed to continuously and homogeneously regulate the speed of EC motors, as well as control and run diagnostics on on-board systems. Control panel with box made of UV-resistant plastic, IP55 degree of protection (EN 60529); operating temperature -25 °C / +60 °C. Water atomization system. The system does not recirculate the water and meets the requirements of Standard VDI 2047-2 certified for health and safety by the Johannes Gutenberg University of Magonza. Operating temperature: +10°C / +50°C. N.B.: the atomizing system must run at a pressure of 2.5 bars to operate properly. Do not use lower pressures. At a pressure of 2.5 bars, the flow rate of each nozzle is 1.11 litres/minute.

RECOMMENDED WATER QUALITY. To guarantee system health and hygiene: use drinking water that meets the requirements of EC Directive 98/83; Total bacterial count <1000 cfu/ml; if there is any doubt about possible bacterial contamination of the drinking water used to supply the system, an optional UV water sterilization kit is available (special accessory not included on basic price list; please, ask to our sales department or specific quotation). To prevent corrosion of the finned core: 6 < pH < 8; conductivity <500 µS/cm; chlorides < 50 ppm; sulphate < 50 ppm. To prevent the formation of scale in the finned heat exchanger: hardness 2-4 °f = Max. 1.1-2.2 °dH = Max. 20-40 ppm of CaCO₃; use a water softener if necessary.

N.B.: the temperature of the atomized water must be at least 5K lower than the temperature of the process fluid flowing out of the heat exchanger.

- Special coil with anti corrosion treatment. The maximum limit of use of the adiabatic system is 4000 hours (ASTM B117).

- MODBUS RS485 serial board



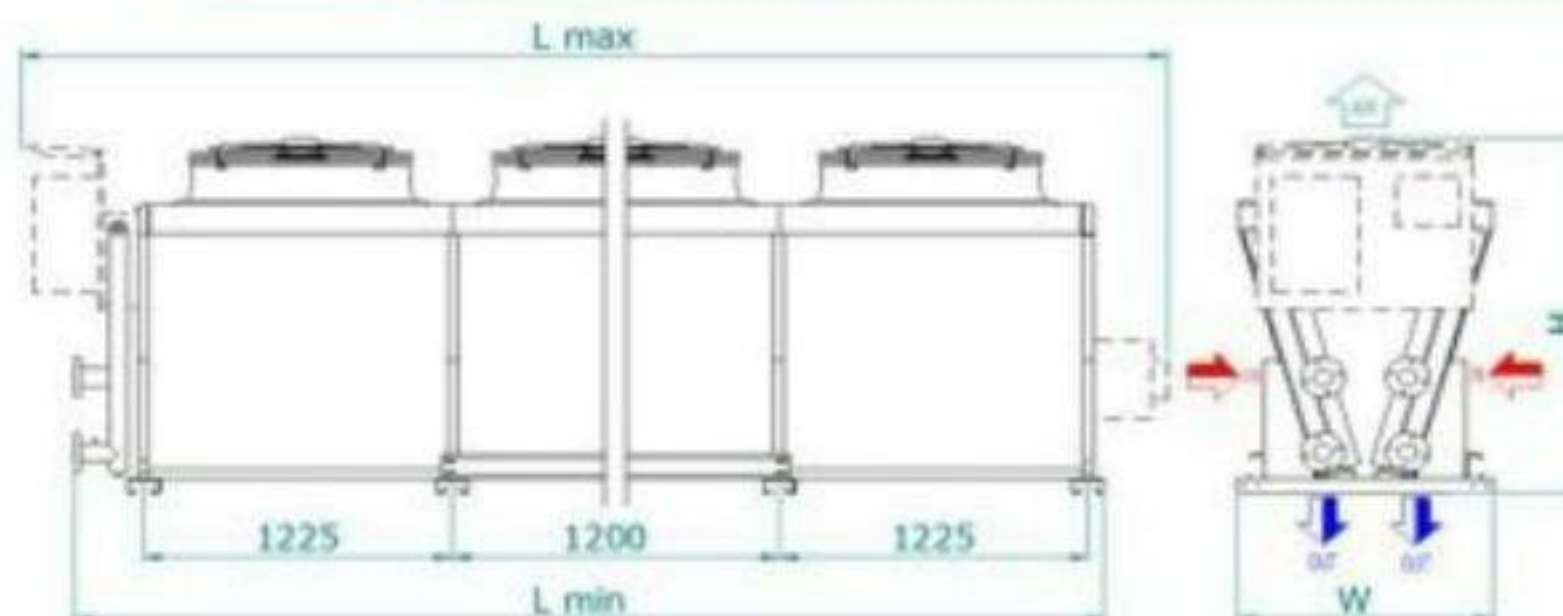
This picture is a mere indication of the product range selected. It may not correspond to the model/unit chosen.

UNIT MODEL:	AFCV290 SPEC		
LW(A) - db(A)	86	N° Fans.	6

Lp(A) - EN13487	54	Dist. (m)	10
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DIMENSIONS

Lmax [m]	8,16
Wmax [m]	1,18
Hmax [m]	1,79

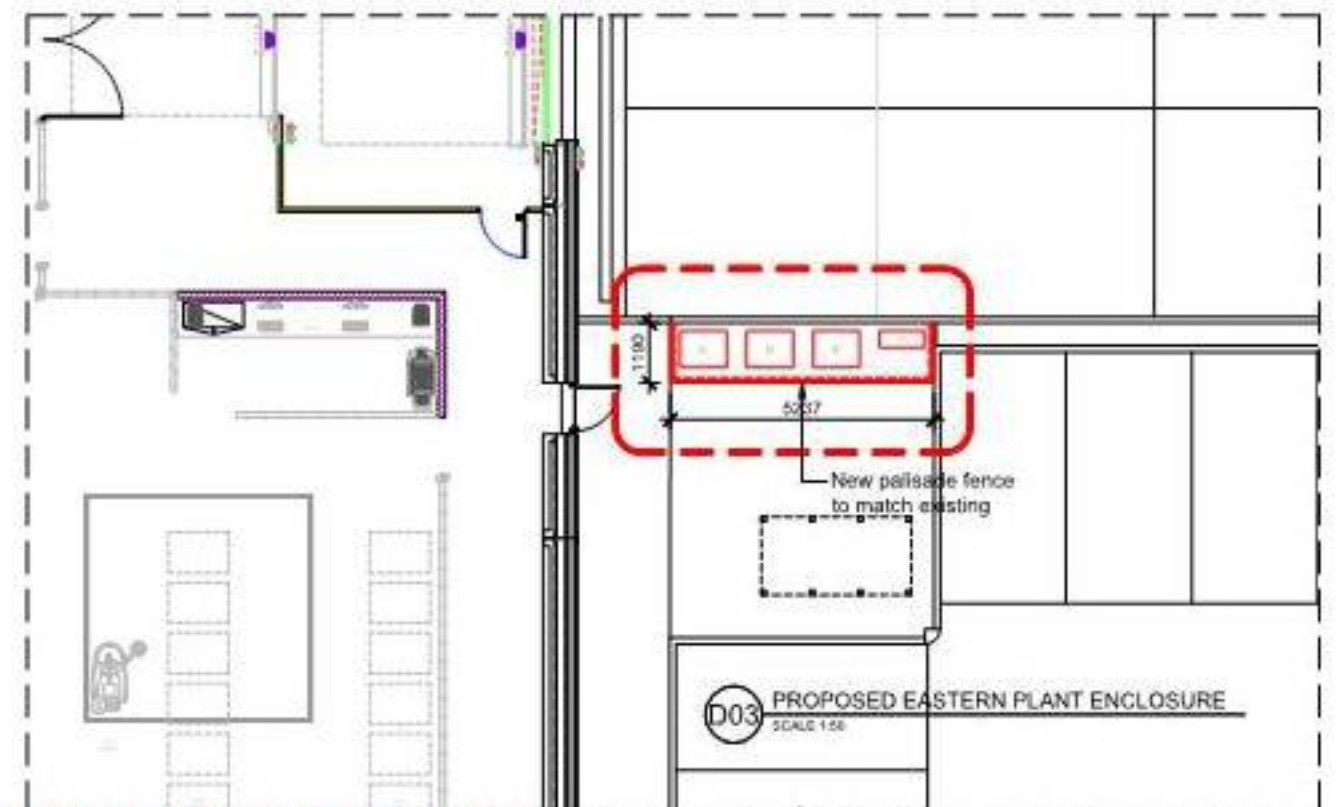
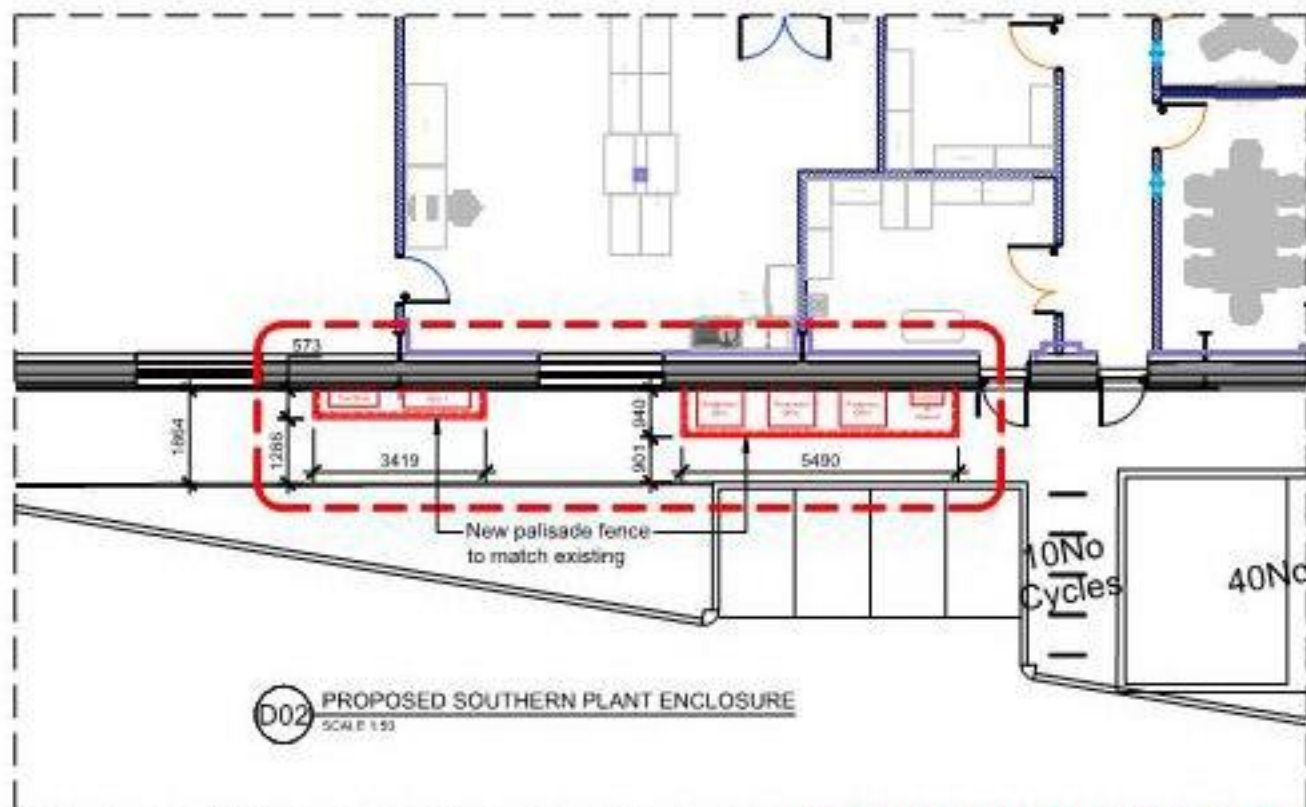
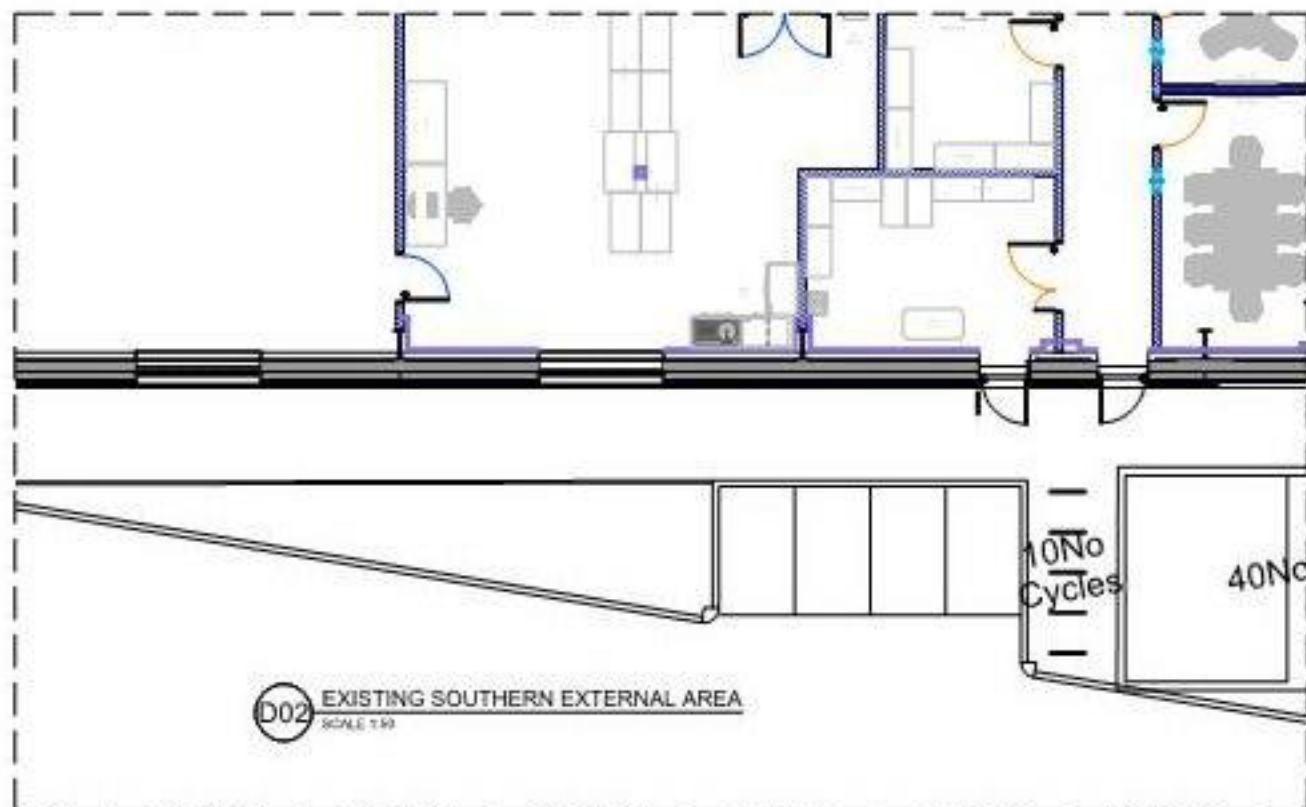


FREQUENCY (Hz)	Lwi(A) [db(A)]
60	65
125	64
250	74
500	80

FREQUENCY (Hz)	Lwi(A) [db(A)]
1000	80
2000	80
4000	78
8000	69

NOTE: Sound Power Levels according to EN13487. The Sound pressure Levels for this Dry Cooler are calculated in free-field conditions for every single fan as stated by the fans constructor in compliance with EN13487. The Sound Pressure figure is merely indicative as it is affected by the installation site characteristics.

APPENDIX D: PROPOSED PLANT LOCATIONS



SOUTHERN & EASTERN PLANT COMPOUND

ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SPECIFIED DRAWING TO BE READ IN CONJUNCTION WITH SCALE OF WORK	
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Figure E21139/ NM 1 : Noise Contour Map at 4m height

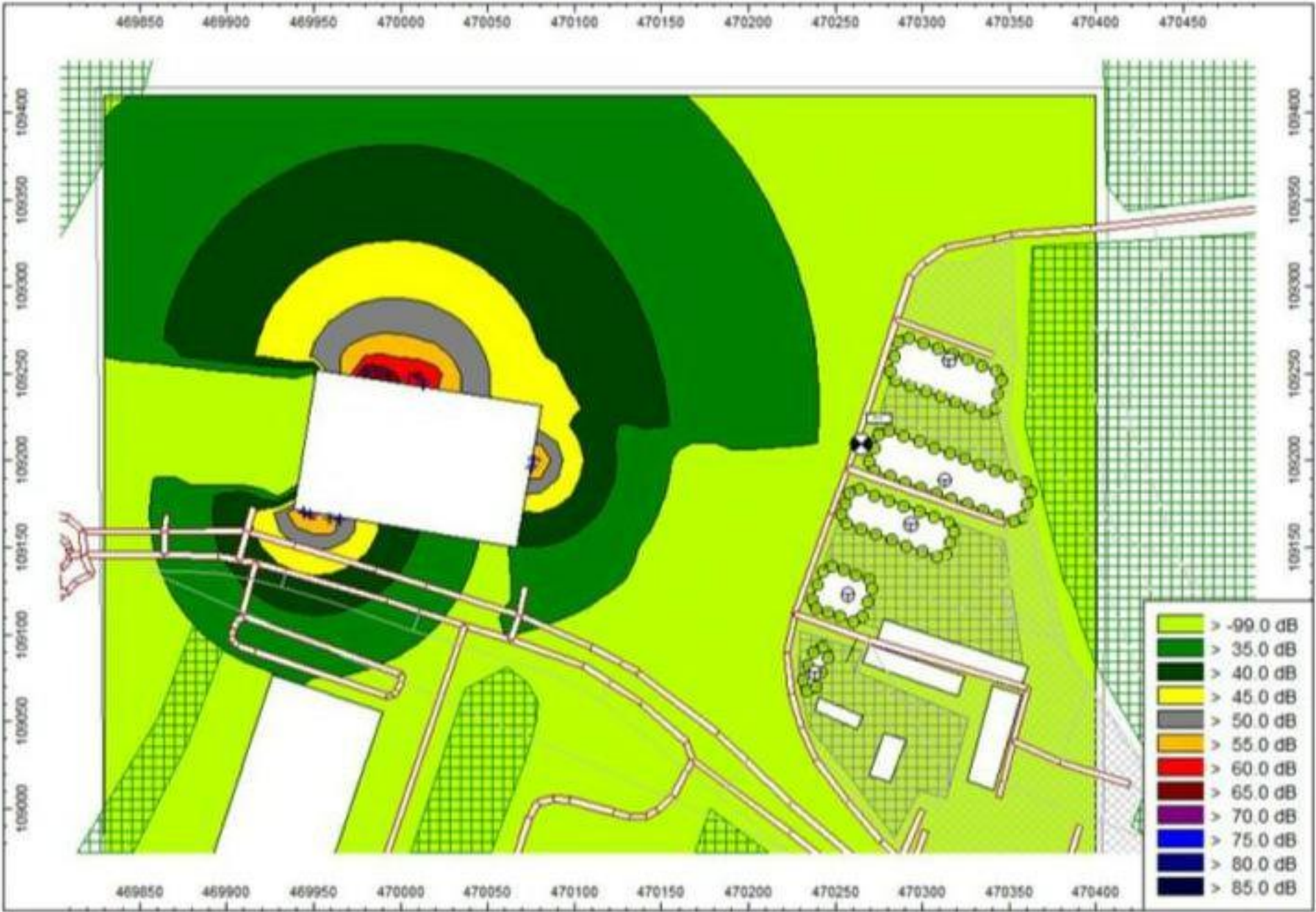


Figure E21139/ SP 1 : Site Plan Showing Plant Locations and Nearest Noise Sensitive Receptors

