

Medawar BSU AHU Replacement Environmental Noise Assessment - Proposals

Addendum

University College London

08 July 2022

5181673-ATK-XX-Z3-RP-AC-01

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This document has 12 pages including the cover.

Document history

Document title: Environmental Noise Assessment - Proposals Addendum Document reference: 5181673-ATK-XX-Z3-RP-AC-01

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	For planning	JR	IM	IM	JR	11/03/2022
2.0	For planning	JD	JR	IM	IM	08/07/2022

Client signoff

Client	University College London
Project	Medawar BSU AHU Replacement
Job number	5181673
Client signature/date	



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Introduction

This report provides an addendum to the proposals on which the Environmental Noise Assessment report produced by MACH Acoustics Ltd for the UCL Medawar BSU AHU Replacement project was based on.



Executive Summary

As part of the Medawar BSU AHU Replacement project, MACH Acoustics Ltd carried out an environmental noise assessment in 2019 based on the project proposals envisaged at the time.

Since then, there has been a change in the proposals, which this addendum document describes.

MACH Acoustics' original environmental noise assessment (dated 11 October 2019) is included in Appendix A of this report.



Abbreviations

Abbreviation	Description
AHU	Air Handling Unit
DX	Direct Expansion
UCL	University College London



1. Project background

An existing AHU serves part of level 3 of UCL's Medawar building. It has reached the end of its economic life, is suffering air leakage and is at risk of failure. In addition, there is no means of providing heat recovery from the exhaust air to the supply air. The AHU plantroom is currently located within the demise at level 3. Due to operational procedures and restrictions, the project therefore incorporates the proposal of a new air handling unit at roof level with the provision of recovering heat from the existing extract system into the new AHU, with associated systems, plant and equipment replacements and provisions as necessary.

2. Original proposals

The original key proposal for this project was to:

- Provide a new AHU at roof level (level 4) and strip out the existing supply AHU at level 3.
- To strip out the existing extract fan and provide a new:
 - Return AHU (option 1)
 - Fan (option 2)
- Replace the existing 4no. DX condensers at roof level serving the existing supply AHU located at level 3 with 3no. new Daikin EWAQ040CWP_MAX chillers to serve the new supply AHU located at roof level.

The original environmental noise assessment carried out by MACH Acoustics Ltd (as included in appendix A) is based on the above proposals.

3. Revised proposals

The revised key proposal for this project are now as follows:

- Provide a new AHU at roof level (level 4) and strip out the existing supply AHU at level 3.
- Retain the existing extract fan and discharge duct and introduce a new heat recovery unit, complete with run-around coil and filter in the extract ductwork.
- Replace the existing 4no. DX condensers at roof level serving the existing supply AHU located at level 3 with 3no. new Daikin EWAT050CZHBA2 chillers to serve the new supply AHU located at roof level.
 - Noise levels of the new EWAT050CZHBA2 chillers are identical to the noise levels of the original proposed chillers (i.e. Lw / Lp @ 1m: 81 dB(A) / 64 dB(A))

A photo of the existing extract fan and discharge duct can be seen in Figure 3-1.





Figure 3-1 - Existing extract fan and discharge duct

A plan layout and section of the revised proposals to the extract system are shown in Figure 3-2 and Figure 3-3 respectively:



Figure 3-2 - Plan layout of revised proposals to the extract system



Figure 3-3 - Section of revised proposals to the extract system

4. Impacts

With the design evolution, the resulting noise impacts are to be in accordance with the planning requirements picking up the key elements stated within the MACH Acoustics report dated 11 October 2019.

The installing contractor will assess the eventual proposed noise performance to ensure that it is in accordance with the criteria described within the MACH Acoustics report.

Key elements from the original MACH Acoustics report that the contractor will comply with will be:

- Noise from the proposed new plant is predicted to be below the existing background noise level at the Foster Court Building.
- The combined noise from retained and new plant is predicted to result in a 2dB excess of the background noise level and suggests a LOAEL to SOAEL noise impact. which shall be checked & verified by the contractor for the final equipment selection & performance.
- This may be an acceptable noise impact, in the absence of nearby residential receptors, however this would need to be agreed with the local planning authority Confirmation has been received from Camden's Pollution Planning Consultant that to keep consistency throughout the borough in terms of noise, 10dB below the background or as near as with mitigation will be required.
- Should plant be required to be designed to be 10dB below the background noise level, then additional attenuation will be necessary to a number of the plant items the originally and revised proposed chillers will not be able to achieve 71 dB(A), hence an acoustic enclosure is now being included in the proposals. As the new chillers are taller (1.9m) compared to the original proposed chillers (1.7m tall), the height of the acoustic enclosure aligns with the top of the revised proposed chillers.

The acoustic louvred screen shall provide sound reduction index (SRI) as per Table 4-1 below.

	63	125	250	500	1k	2k	4k	8k
SRI	6	6	9	13	21	20	16	13

Table 4-1 - Acoustic Louvred screen SRI

Appendices

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Appendix A. Original Environmental Noise Assessment by MACH Acoustics Ltd



UCL MEDAWAR BUILDING

Environmental Noise Assessment

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UCL MEDAWAR BUILDING

Environmental Noise Assessment

Atkins

Revision	Description	Author	Checked by	lssued by	Issue Date
00	First Issue	AB	PJ	PJ	11/10/2019

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APPENDIX F – TECHNICAL DATA

DAIKIN	Те	Technical Data Sheet		
EWAO040CWP MAX	COLUMN COUNTS.			
Bardaumana and a dated area dia	- FN14F11 3-3013	-		
Performances carculated according	ID EN14311-3-2013			
Cooling mode performances				
Cooling capacity	48.70 kW	Evaporator water IN/OUT	12.00 °C / 6.00 °C	
Power input	20.26 kW	Evaporator water flow	2.140 Vs	
EER Cooling Efficiency	2.404 kW / kW	Evaporator pressure drops	25.8 kPa	
		Ambient temperature	35.0 °C	
IPLV.IP	0.000 kW / kW	Lw/Lp@1m	81 dB(A) / 64 dB(A)	
		Evaporator fluid	Ethylene glycol 25%	
		Evaporator fouling factor	4.4E-05.000 m2*C/W	
Sound power level according to ISO 9614-1.				
Unit information				
Compressor type	Scroll	Refrigerant type	R410A	
Capacity control	Inverter Controlled	Condenser type	Tube type	
Compressor N*	4	Condenser fans N*	2	
Circuit N*	2	Condenser fans control	Direct Drive	
Refrigerant charge	7.6 kg	Altitude	0 MSL	
		Evaporator type	Brazed plate	
Actual refrigerant charge depends on the fina	i unit construction, refer to unit nameplate.			
Electrical information				
Power supply	400 V / 50.0 Hz / 3 Ph	Max. inrush current	103 A	
Running current	0A	Compressor starting method	2 VFD + 2 Dol.	
Max. Running current	50.4 A			
Max. current wires sizing	0A			

Voltage tolerance ± 10%. Phase Voltage unbalance ± 3%. Electrical data referred to standard unit without options, refer to unit name plate data.



9/9/2019 CSS Web 10.19



1.0 INTRODUCTION

The roof top plant of the UCL Medawar building in central London is proposed to be refurbished which includes the replacement of a number of existing air handling units. An environmental noise assessment has therefore been undertaken.

Such to establish the existing noise levels across the site, a noise survey has been undertaken. This report describes the noise survey, its results, and the outcomes of subsequent noise break-out assessments.



2.0 ENVIRONMENTAL NOISE SURVEY

To establish the existing environmental noise levels on site, a 24-hour noise survey was conducted between 02/10/2019 and 03/10/2019.

2.1 Site Description

The proposed site is located central to the UCL campus, surrounded by other university buildings including a biology facility to the North, a library to the East, a church to the South-East and an Arts and Humanities block to the West.

The site in relation to its surroundings is presented below.



Figure 2.1: Proposed Development (Red) and Nearest Noise Sensitive Receivers (Blue)



2.2 Noise Sources

Noise levels varied across the site with the dominant noise source being the existing plant equipment on the roof of the building. A summary of the main noise sources is provided below.

Noise Source	Noise Contribution	Description
Plant	Dominant	The existing plant which is situated on the roof of the building.
City Traffic	Ambient	Nearby traffic on roads in the surrounding area contribute towards a general city ambience.

Table 2.1: Summary Of Main Noise Sources

2.3 Noise Sensitive Receivers

Noise Sensitive Receiver	Distance from Site Boundary (m)
Foster Court	3
Biology Laboratory	8
Dr William's Library	24

Table 2.2: Nearest Noise Sensitive Receivers



2.4 Measurement Positions

Measurement positions used throughout the survey are shown below.



Figure 2.2: Fixed (Green) and Spot (Blue) Measurement Positions

This location was selected as it was seen to be representative of nearest educational building. Spot measurements where also taken at each of the existing plant items to be removed during the proposed works.



2.5 Measured Noise Levels

2.5.1 Fixed Position

Noise levels were measured at the fixed position between 12:30 and 14:30. Measured noise levels are presented in the graph below. A summary of these noise levels is shown in Table 2.3.



Figure 2.3: Summary Of Fixed Measurement Positions

	Measured Noise Levels (dB)					
	Maximum	Minimum	Mean			
Lamax	87	57	64			
LAeq,5min	62	55	57			
La90	58	55	56			

Table 2.3: Summary Of Fixed Measurement Positions

The results show that at the measurement location, noise levels were dominated by existing roof top plant.



2.5.2 Spot Positions

Additional spot measurements were taken between 16:36 and 16:52 to establish the noise from existing roof top plant items which are to be removed.

Spot Position	Times (hh:mm)		Measured Noise Level (dB)
		L _{Amax}	68
1	16:36 – 16:37	L _{Aeq,T}	67
		La90	66
		L _{Amax}	79
2	16:38 – 16:39	L _{Aeq,T}	77
		La90	77
		L _{Amax}	71
3	16:43 - 16:44	L _{Aeq,T}	70
		La90	69
		L _{Amax}	61
4	16:48 – 16:49	L _{Aeq,T}	60
		La90	59
		Lamax	70
5	16:51 – 16:52	L _{Aeq,T}	67
		La90	67

Table 2.4: Summary Of Spot Measurements



3.0 NOISE BREAK-OUT ASSESSMENT

3.1 Criteria

BS 4142:2014 "Methods for rating and assessing industrial and commercial sound" describes a method of determining the level of noise of an industrial nature, together with the procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity. As such, an assessment to BS 4142 is typically called for within planning conditions. The likelihood of complaints in response to a noise depends on various factors. BS 4142 assesses the likelihood of complaints by considering the margin by which the noise in question exceeds the background noise level. Additional information on BS 4142 methodology is provided within Appendix A.

3.2 Design Target

The development lies within the London Borough of Camden and Islington. Guidance with regards to plant noise limits has been sought from the following available documentation:

- Camden's Local Area Requirements for Planning Applications 2018
- Camden Local Plan 2017

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL _{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB LAmax	'Rating level' greater than 5dB above background and/or events exceeding 88dBLAmax

The performance requirements outlined within the local plan are illustrated within the Table below.

Table 3.1: Local Planning Guidance

Table 3.2 illustrates that the sensitive receptors relate to residential bedrooms. The exact location of the nearest residential receptors is unknown as it is thought that the majority of the nearest buildings are



either university buildings with education or office accommodation faith or church buildings. An assessment to the nearest educational building has therefore been undertaken.

Following a review of the local plan it is not clear whether the performance targets relate solely to new plant, or to existing plant which undergoes refurbishment as is the case for this scheme. MACH have therefore requested further clarity with regards to this through consultation with the local planning authority, however at the time of writing, a written response clarifying this had not been received. Therefore, guidance has been provided based upon achieving the following two scenarios:

- Noise from existing and new plant should be 0dB below the existing background noise levels.
- Noise from new plant should be designed to be 10dB below the existing background noise level.

Note, this is subject to agreement with the local authority.

MACH is unaware of any residential in close proximity to the proposed development and therefore noise measurements have been undertaken at location representative of the nearest educational building.



3.3 Proposed Options

Two different options are proposed for the roof top plant which are discussed below in the following two sections and include a number of different plant items.

3.3.1 Option A – Return Air AHU

Option A includes the introduction of a new AHU for supply a new separate AHU for extract and 3no. of new chillers. A number of existing plant items will also be removed and include the existing centrifugal extract fan and number of DX units. Option A is illustrated in Figure 3.1 below.



Figure 3.1: Option A

The technical sheets for the noise data is presented within Appendix XX of this report.



3.3.2 Option B – Return Air Fan

Option B includes the introduction of a new AHU for supply with partial extract with filters and heat recovery to separate centrifugal extract fan. A number of existing plant items will also be removed and include the existing centrifugal extract fan and number of DX units. Option B is illustrated in Figure XX below.



Figure 3.2: Option B

The technical sheets for the noise data is presented within Appendix XX of this report.



3.4 Assessment

In order to assess noise breakout from the proposed new roof top plant, a 3D noise model has been to predicted noise at the fixed measurement location and the surrounding buildings.

Noise levels measured at the fixed location which is considered representative of the nearest educational building, were dominated by noise from existing roof top plant. This is illustrated by the flat graph curve in Figure 2.3 and the close relationship between L_{90} and L_{eq} measured during the survey. The L_{90} is therefore considered to representative of plant noise from roof top area at the fixed location.

Noise from the existing roof top plant which is to removed has then been predicted based upon the results of the spot measurements undertaken during the noise survey. This has then been logarithmically subtracted from the existing background noise level to give the predicted noise level in the absence of removed plant.

Noise from the two options has then been predicted and logarithmically added to the predicted noise level in the absence of removed plant.

3.4.1 Option A

The table below provides the Option A assessment to the nearest educational building. Two options have been considered in the absence of confirmation from the local planning authority with regards to the approach to be taken.

	B1	B2
Option A Assessment	Currently Proposed Attenuation dBA	Additional Attenuation dBA
A - Existing L90	54.7	54.7
B - Noise Level with removed plant	54.3	54.3
C - Specific Noise Option A plant Only	53.3	44.3
D - Acoustic Feature Correction	0.0	0.0
E - Rating Level Option A Plant Only	53.3	44.3
F - Difference between L90 and Rating Level (E - B)	-1.0	-10.0
G - Combined Noise level (B + E)	56.8	54.7
H - Difference between L90 and Rating Level (A-G)	2.1	0.0

Table 3.2: Option A Assessment



Assessment A1 illustrates that proposed new roof top plant is predicted to be less than the existing background noise level at the Foster Court Building (F) by 1dB. This suggests that a LAOEL to SOAEL noise impact as per Table 3.1.

Assessment A1 also illustrates that the combined plant noise (maintained plant + new plant) is predicted to exceed the existing background noise level (H) by 2dB. This suggest that a LAOEL to SOAEL noise impact as per Table 3.1.

It is however considered that the nearest buildings are UCL educational buildings and not residential and therefore the above noise impact, may have low significance due to predicted small change in background noise. However, this would need to be agreed by the local authority.

Assessment A2 illustrates that should the proposed new plant be required to achieve a Rating level 10dB below background and thus not increase the overall background noise levels at the nearest educational building, additional attenuation will be necessary.

In order to prevent the background noise level increasing the following attenuation is considered to be necessary:

- Select chillers which can achieve SWL 71dBA, or enclose three chillers within acoustic screen 1.7m
- Select fan unit which can achieve SWL 75dBA, or enclose the extract fan within an acoustic screen.

Please note that confirmation from the local authority is necessary before proceeding with or without additional attenuation.



3.5 Option B

The table below provides the assessment to the nearest educational building. Two options have been considered in the absence of confirmation from the local planning authority with regards to the approach to be taken.

	B1	B2
Option B Assessment	Currently Proposed Attenuation dBA	Additional Attenuation dBA
A - Existing L90	54.7	54.7
B - Noise Level with removed plant	54.3	54.3
C - Specific Noise Option B plant Only	53.3	44.3
D - Acoustic Feature Correction	0.0	0.0
E - Rating Level Option B Plant Only	53.3	44.3
F - Difference between L90 and Rating Level (E - B)	-1.0	-10.0
G - Combined Noise level (B + E)	56.8	54.7
H - Difference between L90 and Rating Level (A-G)	2.1	0.0

Table 3.3: Option B Assessment

Assessment B1 illustrates that proposed new roof top plant is predicted to be less than the existing background noise level at the Foster Court Building (F) by 1dB. This suggests a LAOEL to SOAEL noise impact as per Table 3.3.

Assessment B1 also illustrates that the combined plant noise (maintained plant + new plant) is predicted to exceed the existing background noise level (H) by 2dB. This suggest that a LAOEL to SOAEL noise impact as per Table 3.3.

It is however considered that the nearest buildings are UCL educational buildings and not residential and therefore the above noise impact, may have low significance due to predicted small change in background noise. However, this would need to be agreed by the local authority.

Assessment A2 illustrates that should the proposed new plant be required to achieve a Rating level 10dB below background and thus not increase the overall background noise levels at the nearest educational building, additional attenuation will be necessary.

In order to prevent the background noise level increasing the following attenuation is considered to be necessary:

• Select chillers which can achieve SWL 71dBA, or enclose three chillers within acoustic screen 1.7m

• Select extract fan unit which can achieve SWL 75dBA, or enclose the extract fan within an acoustic screen.

Please note that confirmation from the local authority is necessary before proceeding with or without additional attenuation.

3.6 Discussion

The noise assessments presented within the previous sections illustrate that for both Option A and Option B, noise from the proposed new plant is predicted to be below the existing background noise levels at the Foster Court Building. When this is combined with noise from the existing roof top plant which is to be maintained, noise levels are predicted to be 2dB greater than the existing background noise level. The local planning guidance advises this to be LOAEL to SOAEL impact if the sensitive receptor is residential. As this nearest building is not residential this level of impact may be acceptable however would need to be agreed with the local planning authority.

Should this not be acceptable and plant is required to be 10dB below background, further attenuation to a number of plant items will be necessary. This could be achieved by selecting lower noise generating plant or through the introduction of an acoustics screen to these plant items.



4.0 CONCLUSION

An environmental noise survey, noise impact assessment has been conducted in relation to the proposed alteration to the roof top plant at the Medawar building, UCL. The following points can be concluded:

- An environmental noise survey was conducted from 02/10/19 to 03/10/19.
- The nearest noise sensitive receptor is considered to be the Foster Court building 3m from the roof top plant area, which is understood to be a UCL educational building. MACH is not aware of any residential in the proximity of the roof top plant area.
- At this location existing plant equipment was found to be the dominant noise source with some additional noise contribution from general city ambience and traffic.
- The lowest background noise level was measured to be 55dB L_{A90} which was seen to consistent throughout the survey.
- The proposed works includes two different options for extract and includes a number of different new plant items as well as the retained of existing plant.
- Some existing plant is also to be removed. Operational noise from these plant items has been quantified through spot measurement and the overall reduction in noise due to the removal of these plant items calculated.
- MACH have approached the local authority with regards to specific plant noise requirements, however are yet to receive confirmation as to the assessment approach.
- Noise from the proposed new plant is predicted to be below the existing background noise level at the Foster Court Building.
- The combined noise from retained and new plant is predicted to result in a 2dB excess of the background noise level and suggests a LOAEL to SOAEL noise impact.
- This may be an acceptable noise impact in the absence of nearby residential receptors, however this would need to be agreed with the local planning authority.
- Should plant be required to be designed to be 10dB below the background noise level, then additional attenuation will be necessary to a number of the plant items.



APPENDIX A – METHODOLOGY

BS 7445:2003

Environmental noise measurements were conducted in accordance with BS 7445 "Description and measurement of environmental noise".

BS 4142:2014

BS 4142 states that one should 'obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and consider the following:

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- *b)* A difference of around +10 dB or more is likely to be an indication of a <u>significant</u> adverse impact, depending on the context.
- c) A difference of around + 5 dB is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The aforementioned rating level is based upon the specific noise level of the noise source in question. A correction should be applied to the specific noise level to obtain an increased rating level if *'a tone, impulse or other characteristic occurs, or is expected to be present, for new or modified sound sources.* To summarise, BS4142 section 9.2 advises the following in regard to corrections for acoustic characteristics:

- **Tonality** for sound ranging from not tonal to prominently 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.
- Other sound characteristics Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied
- Intermittency When the specific sound has identifiable on/off conditions, if the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.



APPENDIX B – MEASUREMENT EQUIPMENT

Name	Serial Number	Last Calibrated	Certificate Number	Calibration Due
NTI Precision Sound Analyser XL2 TA	A2A-15207-E0	Nov-18	FL18-023	Nov-20
NTI Pre-amplifier MA220	7856	Nov-18	FL18-023	Nov-20
NTI Microphone Capsule MC230A	A16182	Nov-18	FL18-023	Nov-20
Norsonic Sound Calibrator Type 1251	32090	Apr-19	TCRT19/1289	Apr-20

The measurement equipment listed above was used during the survey, where all equipment complies with BS EN 60942:2003 i.e. a class 1 device.

APPENDIX C – METEOROLOGICAL CONDITIONS

Date	Time (hh:mm)	Temperature (°C)	Humidity (%)	Pressure (hPa)	Wind Speed (mph)	Wind Direction	Conditions
	00:00	11	84	1012	8.0	Ν	Clear
02/10/10	06:00	12	75	1017	8.7	Ν	Passing clouds
02/10/19	12:00	13	56	1019	11.2	NNW	Passing clouds
	18:00	12	79	1021	4.4	NNW	Clear
	00:00	4	96	1021	1.9	W	Clear
02/10/10	06:00	11	89	1019	2.5	NE	Sunny
03/10/19	12:00	14	65	1015	9.9	S	Broken clouds
	18:00	13	84	1009	9.9	S	Passing clouds



APPENDIX D – SITE PHOTOGRAPHS

Location	Image
Fixed Position	



APPENDIX E – NOISE MAPS





APPENDIX F - TECHNICAL DATA

DAIKIN		Те	chnical Data Shee
EWAQ040CWP MAX			(COLUMN / COLUMN)
Performances calculated according	το EN14511+3:2013		
Cooling mode performances			
Cooling capacity	48.70 kW	Evaporator water IN/OUT	12.00 °C / 6.00 °C
Power input	20.26 kW	Evaporator water flow	2.140 Vs
EER Cooling Efficiency	2.404 kW / kW	Evaporator pressure drops	25.8 kPa
		Ambient temperature	35.0 °C
IPLV.IP	0.000 kW / kW	Lw/Lp@1m	81 dB(A) / 64 dB(A)
		Evaporator fluid	Ethylene glycol 25%
		Evaporator fouling factor	4.4E-05.000 m2*C/W
iound power level according to ISO 9614-1.			
Unit information	server and the server of the s		
Compressor type	Scroll	Refrigerant type	8410A
Capacity control	Inverter Controlled	Condenser type	Tube type
Compressor N*	4	Condenser fans N*	2
Circuit N*	2	Condenser fans control	Direct Drive
Refrigerant charge	7.6 kg	Altitude	0 MSL
		Evaporator type	Brazed plate
Actual refrigerant charge depends on the fina	I unit construction, refer to unit nameplate.		
Electrical information			
Power supply	400 V / 50.0 Hz / 3 Ph	Max. inrush current	103 A
Running current	OA	Compressor starting method	2 VFD + 2 Dol.
Max. Running current	50.4 A		
Max. current wires sizing	0A		



9/9/2019 CSS Web 10.19



			Technical data					FläktGroun			
Project name Position/Item Project Location Project reference		EF-01.		Date Contact Person Project notes		10.10.2019 20: Eero Salone					
an type		Centrimaste	r GT+1	Fan data					2021		
an code		GTLB-1-063-1	-21-00	Maxfan	speed				2071 r/mir		
103			1	Construc	tion			and a balance of	Normal fan		
and the state of t				Arrangen	nent		2	ingre iniet, i	Direct Drive		
input values		2760	4	Discharge				Upw	and (U deg)		
volume now rate		2/30	/3	Handedn	ess .			Lentin	anded (LG)		
Output values				Connecti	on						
/olume flow rate		2750	/s	Ducted in	ilet - Duc	ted outlet					
Accessory losses		01	Pa								
an static pressur	e	400	Pa	Gas prop	erties						
an total pressure	2	4421	Pa	Density					1.199 kg/m		
an speed		976	/min	Tempera	ture				20.0 °C		
ihaft power		1.566	W	Humidity	r -				50.00%		
Power from main	s Ped	1.935	kW	Elevation					0 m		
an total efficience	Y	77.6	6								
FP		0.704	(W/m ³ /s	Weight							
fotal sound powe	r level outlet	84.7	B(A)	Fan					91.9 kg		
iound pressure le	evel Lp(A)	70.90	IB(A)	Motor					47.0 kg		
At distance		11	m	Accessor	ies				7.0 kg		
				Total					145.9 kg		
At distance	150 5801 and 150	1 13347-2. Sound dat	n ta below is calculated	Accessor Total calculated fi	ies or selected	connection n	nethod.		7.0 kg 145.9 kg		
in the second second				1.000		4000	0000	1			

 65
 125
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 8000
 UW for

 79.7
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 89.3

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 80.7
 85.7
 79.7
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 82.7
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 70.7
 73.7
 77.7
 74.7
 75.7
 70.7
 62.7
 52.7
 82.4
78.9 Sum dings APAL-6-00300-2-2-8 Hub Belt drive Belt losses HULB-1-063-1-38-0 Motor code Motor type Motor power Nominal speed Motor efficiency - kW IE3 Motor 3.00 kW Speed controller Calculated operating Hz Calculated operating voltage Max speed with motor Calculated max Hz 975r/min 85.6% Frequency Converter 50.1 Hz Efficiency class Motor current IEC-size 1E3 7.00 A 7.7 V 1212 r/min 1325 62.2 Hz 400V 3~50Hz Power supply

84.7

84.7

Data according to ErP-directive

Ducted inlet

Ducted outlet

Overall efficiency nesd	68.7%	Speed	1210 r/min
Efficiency grade N	77	Target efficiency grade N	64
Input power Ped	3.460 kW	Installation category	D
Volume flow rate	27201/s	Efficiency category	total
Pressure	874 Pa	VSD	Yes

ErP 2015 Compliant

Program version 2.0P:19:10:18 / Fan DLL 1.3.4.0

> Page 23 Revision 00



	BAF R HAN	DLING	ELI	s		Backell Ltd., Unit 22, No. 1 Indus T +44 (D) 1207-590 F +44 (D) 1207-501 E also @backell.co. W www.backell.co.	rtrial Estate, Couvett, 1975 1941 ak ak	Co. Durham, DHI 652
AIR HANDLING UNI	T TECHNIC	AL SPECIF	ICATION					
Project:	Animal Hos	using - UCL !	Medawar Buil	lding				
Project Ref.:	BK050246/	C		Unit ref.:		AHU-01 S	supply and Ex	tract
Quantity:	1			UnitNo/R	evision:	1/E		
FlexLine 50 (Reverse os Dimensions W/H/D (eac BacNet MSTP - interfac HyCool Drain Water Ter Manifold DN40, 600mm Regeneration salt 25kg Reducing double nipple, Wastewater connection is Filter cartridge 100 im fc Connection block with b Connection set for Wate Housing filter incl., wall Condensate hose 11.8 x:	mosis sytem t h) - 640 / 785 e card mpering , Material: St AG 1*-½*, D set lending, valve fLine holder and se 2,6 mm, elboo w at BARKEI	o be provided / 420 mm ainless steel i IN 2990 e and samplin rews w 90 degree, L Einal Cou	d by others on 1.4301 ng cock 1* DN40, Steam	site if requi	irod)	e hose 11,8 x	: 2,6 mm, Dra	in hose 1 1/4*
Pipework Commissionin	g at DAKKEI	LL, Pinar Cor	ninissioning c	an sate				
Connection	UN	Ononina		Processes I	and a second		0.8.	
Damper Material		N/A		Damper C	Decration		N/A	
ENHAUST SECTION	C							
EXHAUST SECTION	u							
0016 INLET SECTION	۹							
Connection		Opening		Pressure I	Drop		0 Pa	
Damper Material		N/A		Damper C	peration		N/A	
0017 SOUND ATTENU	JATOR							
Splitters Length/Height	t	1200/1600	mm	Splitters T	hickness		240 mm	
Splitter Material		Standard		Air Space			211.7 mm	
No. of Full Splitters		2		No. of Sid	e Splitters		2	
Pressure Drop		5 Pa						
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Noise Reduction	9	14	25	41	50	48	34	27
0018 PANEL FILTER	8							
Туре		Pleated Enc	rgy panel-J	Filter Gra	de (EN779)		G4	
Filter Size 1 (WxHxD)		4 x 610 x 6	10 x 100 mm					
Filter Size 2 (WxHxD)		2 x 610 x 3	05 x 100 mm					
Filter Size 3 (WxHxD)		N/A						
Face Velocity		1.56 m/s		Pressure I	Orop Calcul:	ation	Dirty	
Filter Withdrawal		Side		Initial Pre	ssure Dron		22 Pa	
Mean Pressure Drop		33 Pa		Final Pres	sure Drop		44 Pa	
Filter Grade/Efficiency	(15016890)							
ePM1	(13010230)	N/R		ePM2.5			N/R	
ePM10		N/R		ePMcoars	e		Coarse 75	

0018 COMPONENT EXTRAS AND NOTES EXTRA - View Glass EXTRA - Magnahelic gauge EXTRA - Internal bulkhead light



)	BAR	KEL	Ι			Hadat Unit 2 T +44 F +44 E alas	H Luf., 12, No. 1 Inde 100 1207-59 100 1207-50 @hashaff.co.	otrial Esta 0575 1541 uk	er, Cansett, Co. D	utum, DHS 652
0 0	AIR HAND	LING UN	11	s		W 117	re bakell co	nk		
AIR HANDLING	UNIT TECHNICAL	SPECIFICATIO)N							
Project:	Animal Housing	g - UCL Medawa	r Bui	lding						
Project Ref.:	BK050246/C			Unit ref.:		А	HU-01 9	Supply	and Extrac	t
Quantity:	1			UnitNo./F	evision:	1/	Е			
EXHAUST SECT	ION H									
0019 ACCESS SE	CTION									
0019 COMPONE	NT EXTRAS AND NO	DTES								
EXTRA - View Gl	255									
EXTRA - Internal I	bulkhead light									
EXTRA - Lockable	door									
0020 PLENUM										
0020 COMPONE	NT EXTRAS AND NO	DTES								
Inlet damper fitted	to each fan									
0021 DIRECT DR	IVE FAN									
Air Volume	2.75 m3/sec					Pressi	are Dro	P	25 Pa	
External Static	400 Pa	Total Static		694 Pa		Total	Fan Pro	ssure	694 Pa	
Fan:										
Туре	Plenum fan BC AC Motor	Model		GMEB-1-	04-045-2	280 IE3				
Fan Speed	1955 RPM	Fan Max Speed	d	2313 RPM	RPM Quantit		tity		2	
Fan Absorbed Power	1.31 kW	Fan Efficiency		77.8 %		Fan Arragement		ent	Dual Fan (50%-50%)	
Motor:										
Type	WithFan	Quantity		2		Electr	ic Supp	dy 👘	400V/3/	50Hz
Rated Power	2.20 kW	Power Input		1.55 kW		Full L	oad Cu	rrent	4.87 A	
Motor Speed	1455 RPM	Motor Pole		TBA		Opera	ting Fr	eq	67.2 Hz	
Frame Size	90S	Starting Metho	bd	Inverter		Max I	req		52.41 Hz	
Fan noise levels pe	er fan									
Frequency (Hz)			63	125	250	500	1K	2K	4K	8K.
Fan inlet sound po	wer level (dB)		66	68	82	75	71	71	68	62
Pan outlet sound p	sower level (ab)		00	04	13	/4	13	13	12	70
0021 COMPONES	NT EXTRAS AND NO	DIES								
MOTOR - Isolator	fitted with early break	external contacts								
PFAN - Direct driv	e fans suitable for inve	rter speed control								
EATRA - Lockable	door									
EXTRA - View Gl	155									
EXTRA - Internal I	buikhead light									
EXTRA - Dual fan	(50%-50%) configurat	ion								
Fans sele	cted to achieve approx.	ob% volume wit	n on	e tan runnin	8-					
EXTRA - Fan moto	or wired to external loci	sable isolator								
EXTRA - Stated fa	n absorbed power does	not include moto	r and	d inverter ef	sciency l	osses - p	lease ref	er to S	FP calculat	ions
EXHAUST SECT	ION I									



BARKELL

Barkell Ltd., Uni 22, No.1 Industrial Estate, Consott, Co. Darham, DHI 652 Y +44 (b) 1207-590275 F +44 (b) 1207-591541 E also [Darket] on als W wave Indust() on als

AIR HANDLING	UNIT TECHNICA	L SPECIFICATE	ON								
Project:	Animal Housi	Animal Housing - UCL Medawar Build				Option A and Option B: Supply AHU					
Project Ref.:	BK050246/C	BK050246/C			Unit ref.: Option B: Part			rtial e	ial extract side		
Quantity:	1			UnitNo/R	evision	compo	nents	(Add	tionally	Flaktwood	
005 RIGID FILTE	RS					centrin	ugan ia	"			
Type	1	F7-20mm hdr-Ultir (Glass)-J	ma RP	Filter Gra	de (EN7	79)		F7			
Filter Size 1 (WxH)	xD) 4	4 x 610 x 610 x 30	0 mm								
Filter Size 2 (WxH)	xD) :	2 x 610 x 305 x 30	0 mm								
Filter Size 3 (WxHz	xD) 1	N/A									
Face Velocity	1	1.49 m/s		Pressure l)rop Ca	lculation		Dir	ty		
Filter Withdrawal	1	Side		Initial Pressure Drop			351	Pa			
Mean Pressure Dro	ip :	53 Pa		Final Pres	sure Dr	op		711	Pa		
Filter Grade/Efficie	ency (ISO16890)										
ePM1	(50 %		ePM25				N/F	2		
ePM10	1	N/R		ePMcoars	e			N/F	2		
005 COMPONENT	FEXTRAS AND N	OTES									
Side withdrawal slid	les										
View Glass											
Pressure tappings up	and downstream of	filter									
Component label											
Magnahelic gauge											
Internal bulkhead lig	ght wired to weather	proof switch.									
Lockable door											
SUPPLY SECTIO	NC										
006 PLENUM											
006 COMPONENT	FEXTRAS AND N	OTES									
Inlet damper fitted to	o each fan										
007 DIRECT DRIV	VE FAN										
Air Volume	2.60 m3/sec					Press	ure Dro	P	25 Pa		
External Static	400 Pa	Total Static		1310 Pa		Total	Fan Pro	ssure	1310 Pa		
Ean:											
Туре	Plenum fan BC A/ Motor	C Model		GMEB-1-	2-035-4	-4080 IE3					
Fan Speed	3526 RPM	Fan Max Spec	ed	4240 RPM		Quan	tity		2		
Fan Absorbed Power	2.29 kW	Fan Efficiency	y	80.43 %		Fan Arragement		ent	Dual Fan (50%-50%)		
Motor:											
Type	WithFan	Quantity		2		Electr	ric Supp	dy	400V/3/	50Hz	
Rated Power	4.00 kW	Power Input		2.66 kW		Full Load Current		7.45 A			
Motor Speed	2920 RPM	Motor Pole		TBA		Operating Freq		60.39 Hz			
Frame Size	112M	Starting Meth	od	Inverter by others		Max Freq			72.60 Hz		
Fan noise levels per	r fan										
Erequency (Ha)			63	125	250	500	1K	2K	4K	100 B 10	
requency (mz)										8K.	
Fan inlet sound po	wer level (dB)		70	71	85	84	74	74	71	8K 65	
Fan inlet sound po Fan outlet sound po	wer level (dB) ower level (dB)		70 77	71 72	85 79	84 79	74 79	74 79	71 77	8K 65 75	

007 COMPONENT EXTRAS AND NOTES Each isolator fitted with early break external contacts



0014 DRAIN PAN

Турс

Full Fixed 25mm Connection

) • (A I	RHAN	DLING	ELI	s		Backell Ltd., Unit 22, No. 1 Industr II +44 (D) 1207-5902 II +44 (D) 1207-5915 E also (Bhackell co. sh W www. backell.co.sh	tial Estate, Consett, 1 175 41 6 8	Co. Derham, DHI 452	
AIR HANDLING UNIT	TECHNIC	AL SPECIF	ICATION						
Project:	Animal Hos	ising - UCL	Medawar Buil	ding	Opti	on A and	Option B:	Supply AHU	
Project Ref.:	BK050246/	С		Unit ref.:	Opti	on B: Par	tial extract	side	
Quantity:	1			UnitNo/Re	vision COM	ponents (Additional	ly Flaktwoods	
0011 SOUND ATTENU	ATOR				cen	ntugal tan	0	_	
Splitters Length/Height		1200/1600	mm	Splitters T	hickness		240 mm		
Splitter Material		Standard		Air Space			211.7 mm		
No. of Full Splitters		2		No. of Side	Splitters		2		
Pressure Drop		4 Pa							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
Noise Reduction	9	14	25	41	50	48	34	27	
SUPPLY SECTION E									
0012 HEPA FILTERS									
Туре		Minipleat F	ligh Cap	Filter Grade (EN779)			H13		
Eilter Size 1 (WellerD)		Hepa-J 2 x 305 x 6	10 x 300 mm						
Filter Size 2 (WxHxD)		2 x 505 x 6	10 x 300 mm						
Filter Size 3 (WxHxD)		N/A	10 x 500 mm						
Face Velocity		2.32 m/s		Pressure D	rop Calcula	tion	Dirty		
Filter Withdrawal		Hena		Initial Pressure Drop			195 Pa		
Mean Pressure Drop		332 Pa		Final Press	ure Drop		468 Pa		
Filter Grade/Efficiency	(ISO16890)				-				
ePM1		TBA		ePM2.5			TBA		
ePM10		TBA		ePMcoarse			TBA		
0012 COMPONENT E	XTRAS ANI	NOTES							
NOTE: Space only for fu	ture HEPA fi	ilters to be su	pplied and fit	ted by others					
HEPA filter dirty pressur	e drop is as p	er recommer	ided manufact	turer end of 1	ife pressure d	lrop in order	to extend filte	rr life.	
Future pressure is include	ed in fan and	SFP calculat	ions above.						
Component label									
Magnahelic gauge									
View Glass									
Internal bulkhead light w	ired to switch	1							
SUPPLY SECTION F									
0013 ACCESS SECTIO	N .								
0013 COMPONENT E	XTRAS ANI	0 NOTES							
Standard hinged door fur	niture								
View Glass									
Internal bulkhead light w	ired to switch	1							
0014 INDIRECT HUM	IDIFER								
Duty	60 kg/h			Power Rat	ing	2 @ 30 kW			
Control Options	Variable			Dimension	s (WxHxD)	530 x 780 x	0 x 406 mm		
Cabinet Location	Inset			Electric Su	Electric Supply 400V		0V/3Ph/50Hz		
Pressure Drop	0 Pa			Type		2 x RS40 (I	Resistive)		
Full Load Current	43.3 Amps								

Material

Stainless Steel (304)



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