



External Plant Noise Assessment

Base Building

Manchester

M15 6LR

Stroma Built Environment Ltd.

SBE Ref: PRO-062587 – AC - 1v1

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Stroma Built Environment Ltd. The Maltings Burton Road Sheffield S3 8BZ | Tel: 0114 2723004 | Fax: 0114 2723003

www.stroma.com/built-environment | email: BEnfo@stroma.com

Registered Number 04507219 – VAT No. 154 765 781



I. Revision History

Revision	Date	Description		
1v1	25/01/2022	Draft for comment		
		Compiled By	Authorised By	
		Ben Reed MIOA Senior Acoustic Consultant	Alun Williams MIOA Senior Acoustic Consultant	

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II. Executive Summary

Stroma Built Environment (SBE) has undertaken a noise impact assessment for external building services plant associated with the new Base Building, Manchester, to comply with the requirements of Planning Condition 18 set by Manchester City Council as part of planning permission approval granted in January 2020 (ref. 125018/FO/2019).

The assessment considers the cumulative plant noise impact from fixed building services equipment associated with the new building relative to pre-development background sound levels measured during a site noise survey carried out by BDP in April 2019.

Assessment indicates that plant noise rating levels at the most exposed residential noise sensitive receptors will fall below the existing representative background sound level during the day (07:00 to 23:00) and night (23:00 to 07:00).

Condition 18 further requires that verification testing be carried out to ensure that predicted noise levels are met upon completion, which should be carried out once the building plant is operating.

It is therefore concluded that the requirements of Planning Condition 18 can be met.

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1. Introduction

- 1.1 Caddick Construction has appointed Stroma Built Environment (SBE) to provide acoustic consultancy for the externally located M&E plant at Base Building, Manchester.
- 1.2 The purpose of this report is to assess the acoustic impact of mechanical building services plant associated with the new building on the existing noise climate at the nearest noise sensitive receptors to comply with Planning Condition 18 set by Manchester City Council as part of planning permission approval granted in January 2020 (ref. 125018/FO/2019).
- 1.3 This assessment utilises up to date plant selections, building geometry and assesses noise impact during the day and night-time periods.
- 1.4 Assessments are based on manufacturer supplied plant equipment data including type, locations and noise emissions supplied to SBE.
- 1.5 This document has been prepared for the sole use, benefit and information of the client for the purposes set out in the document or instructions commissioning the works. The liability of SBE in respect of the information contained herein will not extend to any third party.
- 1.6 Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature. A glossary of terminology is included in Appendix V.

2. Noise Assessment Guidance and Criteria

Manchester City Council Planning Condition

- 2.1 Planning approval was granted for the development by Manchester City Council in January 2020, subject to conditions. Condition 18 which this assessment directly addresses is repeated below.

“18) Prior to occupation of the development a scheme for the acoustic insulation of any externally mounted ancillary equipment to ensure that it achieves a rating level (L_{Aeq}) of 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive location shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the equipment.

Upon completion of the development a verification report will be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria has been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria. The approved scheme shall be implemented prior to occupancy and shall remain operational thereafter.

Reason - To safeguard the amenities of the occupiers of nearby residential accommodation, pursuant to policies SP1 and DM1 of the Core Strategy.”

BS 4142:2014 +A1:2019 ‘Methods for rating and assessing industrial and commercial sound’

- 2.2 British Standard BS 4142:2014, *Methods for rating and assessing industrial and commercial sound* (BS 4142), describes a method for assessing the adverse impact from noise sources that are of an industrial nature (e.g. fans, pumps, chillers, air handling units etc.). The assessment methodology is based upon determining a ‘rating level’ ($L_{A_{r,Tr}}$) for the equipment being assessed, which is the combined level of noise from the item or items of plant being assessed, the ‘specific noise level’ (measured as an $L_{Aeq,T}$), plus corrections for acoustic features, where applicable.
- 2.3 The rating level is then compared with the underlying background sound level (measured as an L_{A90}) in the absence of noise from the item or items of plant being assessed.
- 2.4 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.

- 2.5 BS 4142 states that a penalty should be added for any plant which gives rise to noise features that may increase disturbance such as tonal, impulsive or intermittent characteristics. With respect to the acoustic feature correction, BS 4142 states:

“Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level.”

- 2.6 A rating penalty for a sound may be based on a subjective assessment of its characteristics or using objective methods to determine tonality.

British Standard 7445-2: 1991 ‘Description and measurement of environmental noise — Part 2: Guide to the acquisition of data pertinent to land use’

- 2.7 BS 7445-2:1991 provides guidance on the collection and reporting of environmental noise affecting land on which new developments are planned. It contains guidance on suitable measurement equipment, monitoring locations and averaging periods, and provides a method for determining a ‘rating level’ in order to characterise the measured noise levels. It states that where sounds contain tonal or impulsive characteristics an adjustment may be applied, however, the magnitude of the adjustment to be made is not quantified absolutely. More specific guidance is available in BS 4142, which is shown above.

3. Site Description

- 3.1 The development is located within Manchester Science Park, Greenheys, Manchester. Greenheys Lane borders the site to the west with residential properties beyond that. Commercial buildings generally bound the site to the north and east with Darul Aman Mosque located to the south.
- 3.2 The closest noise sensitive receptors (NSRs) to the proposed building have been identified per the below list and are highlighted in Figure 1:
- Residential properties on Greenheys Lane to the west;
 - Darul Aman Mosque to the south;
 - Rutherford House office building to the east; and
 - Greenheys Technology building to the north



Figure 1: Site location and noise sensitive receptors

- 3.3 A baseline noise survey has been undertaken in and around the site previously by BDP in April 2019. Data obtained from the measurements and subsequent calculations were used to establish relevant background noise criteria for noise assessment from building services plant in accordance with the requirements of Condition 18.

- 3.4 Full details of the measurements conducted by BDP are presented in the BASE, Manchester Environmental Noise Assessment Report (ref. P3000608/(REP)U002) dated August 2019 and are reproduced in Appendix I.
- 3.5 Based on the requirements of Condition 18 and measured background noise survey data, total emission levels for plant noise, including acoustic feature corrections where applicable, should not exceed the maximum noise rating level values provided in Table 1.

Table 1: Building services plant noise limits

NSR	Assessment period	Representative background noise level (dB $L_{A90,T}$)	Rating noise limit (dB $L_{A,r,T,r}$)
Residential properties on Greenheys Lane	Daytime (07:00-23:00)	48	≤ 43
	Night Time (23:00-07:00)	38	≤ 33
Darul Aman Mosque	Daytime (07:00-23:00)	42	≤ 37
Rutherford House	Daytime (07:00-23:00)	43	≤ 38
Greenheys Technology building	Daytime (07:00-23:00)	45	≤ 40

4. Noise Impact Assessment

- 4.1 A detailed noise model has been produced using CadnaA noise modelling software in order to calculate resulting noise levels at the NSRs from building services plant. The noise model was set to include reflections up to the second order with ground set to be fully reflective. The terrain surrounding the site is generally flat, as such topographical data has been excluded from the model.
- 4.2 Fixed building services plant serving the scheme as included within the model is summarised in Table 2.

Table 2: Building services plant summary

Reference	Type	Unit
AHU-RF-01	Air Handling Unit	Envistar Flex
AHU-RF-02		
AHU-RF-03		
AHU-RF-04		
ASHP-RF-01	Air Source Heat Pump	Ecodan ASHP 14kW R410a 1Ph Mono Zbdn
OU-RF-01	Condenser	Mitsubishi PURY-EP350YNW-A1
OU-RF-02		Mitsubishi PURY-EP450YNW-A1
OU-RF-03		Mitsubishi PURY-EP400YNW-A1
OU-RF-04		Mitsubishi PURY-EP500YNW-A1
OU-RF-05		Mitsubishi PURY-EP350YNW-A1
OU-RF-06		Mitsubishi PURY-EP450YNW-A1
OU-RF-07		
OU-RF-08		
OU-RF-09		
OU-RF-10		Mitsubishi PURY-EP500YNW-A1
OU-RF-11		Mitsubishi PURY-EP450YNW-A1
OU-RF-12		
MVHR-GF-01	Mechanical Ventilation Unit	Nuaire XBC55HA-NNN-C-LS1S
MVHR-MZ-01		Nuaire XBC45HA-NNN-C-LB1S
MVHR-MZ-02		Nuaire XBC25HA-NNN-C-LB1S
MVHR-MZ-03		
MVHR-MZ-04		

- 4.3 Information as provided by the client which has been used to inform the noise model, including building services plant layouts are shown in Appendix II and manufacturers' noise data and attenuator insertion losses are included in Appendix III.

- 4.4 It has been assumed that all plant will potentially operate at any time during a 24-hour period and assessment has been undertaken as such. This presents a worst-case assessment.
- 4.5 Acoustic losses due to ducting and ducting terminations have not been included; as such, the resultant noise levels on site are anticipated to be lower than calculated.
- 4.6 The results of the assessment are summarised in Table 3.

Table 3: Noise impact assessment against BREEAM requirements

NSR	Assessment period	Rating noise limit (dB $L_{Ar,Tr}$)	Highest calculated noise rating level at receptor $L_{Ar,Tr}$ (dB)
Residential properties on Greenheys Lane	Daytime (07:00-23:00)	≤ 43	27
	Night Time (23:00-07:00)	≤ 33	
Darul Aman Mosque	Daytime (07:00-23:00)	≤ 37	15
Rutherford House	Daytime (07:00-23:00)	≤ 38	16
Greenheys Technology building	Daytime (07:00-23:00)	≤ 40	22

- 4.7 Based on the type of plant, manufacturer noise data provided and the context of the site and its surroundings (busy city centre), it is not expected that any impulsive or tonal characteristics, or distinctive intermittency to the noise emitted would be observable. Despite this, a conservative acoustic feature correction of +2 dB for potential tonality has been added. This correction is in line with guidance set out on BS 4142.
- 4.8 The results in Table 3 show that worst-case plant noise egress from the development falls well below the acoustic criteria per the requirements of Condition 18.

5. Conclusion

- 5.1 A plant noise impact assessment has been undertaken for external building services plant associated with the new Base Building, Manchester to comply with Planning Condition 18 set by Manchester City Council as part of planning permission approval granted in January 2020 (ref. 125018/FO/2019). The assessment considers the cumulative building services plant noise impact from equipment associated with the building.
- 5.2 The assessment indicates that the noise rating level of building services plant considered at the most exposed noise sensitive receptors falls well below the existing background sound level during day and night-time operation.
- 5.3 Condition 18 further requires that verification testing be carried out to ensure that predicted noise levels are met upon completion, which should be carried out once the building plant is operating.
- 5.4 It is therefore concluded that the requirements of Condition 18 can be met.

Appendix I. BDP Noise Survey

4.3 Survey Methodology

A series of manned short-term measurements were undertaken by BDP Acoustics at a number of locations on and in the vicinity of the proposed Project site during 'worst-case' daytime, evening and night-time periods.

The approximate measurement positions are presented in Figure 1. Measurement positions were selected in order to:

- Measure worst-case, i.e. noisiest, daytime (0900 – 1120 hours) noise levels at the locations of the proposed building façades in order to establish the noise levels that will impact upon the façades of the proposed building (Positions 1 – 6);
- Provide data representative of the worst-case, i.e. quietest, daytime (1120 – 1300 hours), evening (2200 – 2300 hours) and night-time (0300 – 0400 hours) noise levels at the nearest or most exposed noise sensitive receptors for the purposes of informing environmental plant noise limits to maintain residential amenity (Positions 3 – 5 and 7 – 9).

Weather conditions during the daytime survey were dry with low wind speeds (<2m/s), temperatures varying around 10°C and cloud cover of approximately 10%. Weather conditions during the evening survey were dry with no wind, temperatures of 12°C and 100% cloud cover. Weather conditions during the night-time survey were dry with no wind, temperatures of 8°C and no cloud cover.

The instrumentation used for measurements consisted of 2no. Rion NA-28 sound level meters and 1no. Bruel & Kjaer 2260 sound level meter, which were all calibrated before and after the surveys, with no significant drift in sensitivity observed.

At each position octave band and A-weighted fast response levels were recorded for a comprehensive suite of noise level metrics.

All readings were taken at a height of 1.5m above local ground level in free-field conditions, with the exception of façade measurements taken at Position 1.

Measurements were carried out by Gavin Stevenson MIOA, Dan Forbes AMIOA and Martha Sadler SMIOA.

4.4 Results

A summary of the measured results are presented in Table 2 below.

Table 2: Summary of noise measurement results

Measurement Position	Start Time (dd/mm/yyyy hh:mm)	$L_{Aeq,5mins}$ Range (dB)	$L_{AFmax,5mins}$ Range (dB)	$L_{A90,5mins}$ Range (dB)
1	29/04/2019 09:08	58	64 - 75	56
1	29/04/2019 10:07	52 - 53	62 - 70	43 - 45
2	29/04/2019 09:28	65 - 67	76 - 84	49 - 57
2	29/04/2019 10:31	63 - 64	74 - 77	49 - 50
3	29/04/2019 09:48	52 - 54	65 - 72	45 - 46
3	29/04/2019 10:55	51 - 53	61 - 63	45 - 48
3	29/04/2019 12:00	53 - 54	66 - 72	46 - 47
4	29/04/2019 09:03	48 - 50	56 - 75	46 - 47
4	29/04/2019 10:06	46 - 47	60 - 61	42 - 43
4	29/04/2019 11:21	47 - 49	61 - 65	43 - 44
5	29/04/2019 09:21	46 - 49	52 - 60	44 - 45
5	29/04/2019 10:24	48 - 51	60 - 66	45 - 46
5	29/04/2019 11:38	46 - 47	57 - 67	43 - 44
6	29/04/2019 09:38	46 - 47	54 - 63	42
6	29/04/2019 10:41	48 - 50	60 - 65	41 - 45
7	29/04/2019 11:45	64 - 65	76 - 78	48 - 50
7	30/04/2019 22:03	60 - 63	73 - 77	44 - 46
7	02/05/2019 03:00	47 - 50	66 - 70	38 - 39
8	29/04/2019 12:22	48 - 51	61 - 71	44 - 45
9	30/04/2019 22:27	45 - 46	55 - 61	38 - 39
9	02/05/2019 03:24	40	46 - 53	38

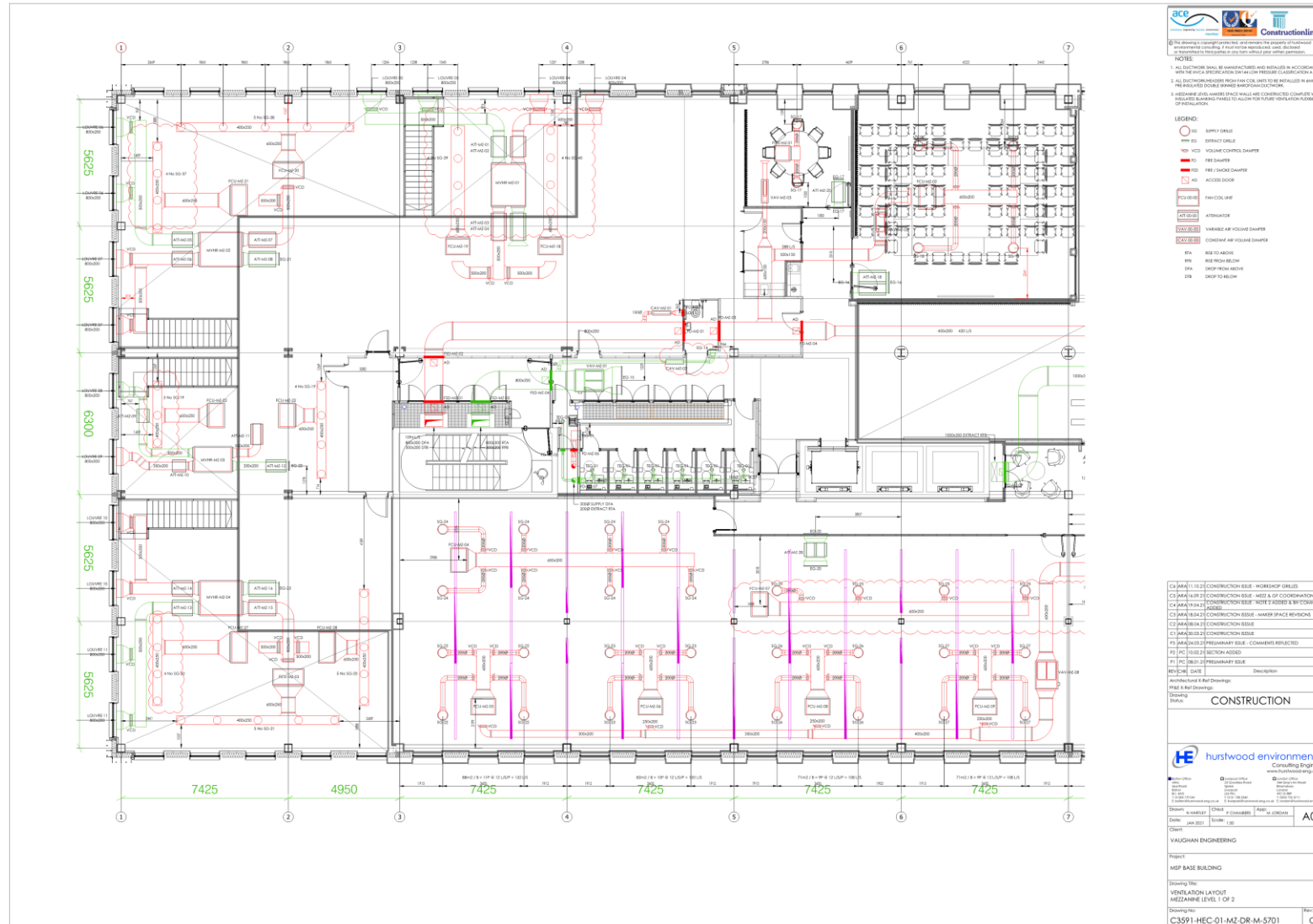
Figure 1: Approximate survey measurement positions

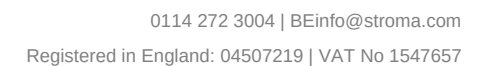


Figure 2: Noise monitoring positions (1 to 9 from top left to bottom right)



Base Building, Manchester
External Plant Noise Assessment
SBE Ref. PRO-062587 AC 1v1





Appendix III. Manufacturer Noise Data and Attenuator Insertion Losses



Envistar Flex

Technical data

2 (3)

Project

MSP Base Manchester

AHU

*AHU-RF-01

Size

850-2V 6.37/6.37 m³/s



Sound data (sound power EN13053)

Frequency band	63	125	250	500	1k	2k	4k	8k	Total
Supply air:									
To surroundings	76	78	62	54	48	45	42	33	63 dB(A)
Outdoor air	72	73	67	62	54	47	38	32	64 dB(A)
Supply air	81	87	83	83	80	76	73	69	85 dB(A)
Extract air:									
To surroundings	77	78	63	54	51	48	47	39	64 dB(A)
Extract air	74	74	68	63	61	55	48	44	66 dB(A)
Exhaust air	81	86	83	83	79	75	72	69	84 dB(A)
Total:									
To surroundings	80	81	66	57	53	50	48	40	67 dB(A)



Envistar Flex

Technical data

2 (3)

Project

MSP Base Manchester

AHU

*AHU-RF-02

Size

980-2V 7.37/7.37 m³/s



Fans		Supply air		Extract air	
Output	Total static pressure	606		648	Pa
	Fan rpm	1,391		1,143	r/m
	Fan efficiency static	74.0		77.0	%
	(Fan efficiency tot)	80.0		80.0	%
	Input power fan	6.04		6.20	kW
	Motor efficiency incl. speed control	89.2		88.3	%
	Total efficiency	66.0		68.0	%
	Fan power at dim press	6.77		7.02	kW
	Fan power clean filter	6.32		6.59	kW
	Motor output Power	2 x 6.50		2 x 6.50	kW
	Motor current at 400V, 3-fase	2 x 12.2		2 x 11.5	A
	Max. rpm	1,800		1,400	r/m
	Capacity reserve	54		46	%
	Max. frequency	150		117	Hz
	Temperature increase	0.77		0.79	°C
	SFPint	365		327	W/(m³/s)
	Fan type	063G-PFJ1-0650		071G-PFJ1-0650	
	K-factor for air flow measuring	4.50		3.62	
	Weight fan unit	114		128	kg

Sound data (sound power EN13053)

Frequency band	63	125	250	500	1k	2k	4k	8k	Total	
Supply air:										/
To surroundings	74	76	62	54	50	54	47	36	dB	63 dB(A)
Outdoor air	70	78	70	64	57	52	43	33	dB	67 dB(A)
Supply air	79	85	83	83	82	85	78	72	dB	89 dB(A)
Extract air:										
To surroundings	74	76	61	50	51	49	49	41	dB	62 dB(A)
Extract air	70	76	70	64	63	59	53	44	dB	68 dB(A)
Exhaust air	78	84	81	79	79	76	74	71	dB	84 dB(A)
Total:										
To surroundings	77	79	65	55	54	55	51	42	dB	66 dB(A)



Envistar Flex	<i>Technical data</i>	2 (3)
Project	MSP Base Manchester	
AHU	*AHU-RF-03	
Size	100-2V 0.63/0.63 m³/s	



Sound data (sound power EN13053)

Frequency band	63	125	250	500	1k	2k	4k	8k		Total	
Supply air:										/	
To surroundings	59	56	50	40	40	35	31	25	dB	47	dB(A)
Outdoor air	57	57	54	52	44	37	28	22	dB	52	dB(A)
Supply air	64	65	71	69	72	66	62	61	dB	75	dB(A)
Extract air:											
To surroundings	60	57	51	40	39	36	30	25	dB	47	dB(A)
Extract air	58	58	56	53	44	38	29	22	dB	53	dB(A)
Exhaust air	64	65	71	69	71	66	61	61	dB	74	dB(A)
Total:											
To surroundings	63	60	54	43	43	39	34	28	dB	50	dB(A)



Envistar Flex	<i>Technical data</i>	2 (3)
Project	MSP Base Manchester	
AHU	*AHU-RF-04	
Size	100-2V 0.43/0.43 m³/s	



Sound data (sound power EN13053)

Frequency band	63	125	250	500	1k	2k	4k	8k		Total	
Supply air:										/	
To surroundings	53	61	44	36	35	32	25	16	dB	46	dB(A)
Outdoor air	51	59	49	48	40	33	23	13	dB	49	dB(A)
Supply air	58	70	65	65	67	63	56	52	dB	70	dB(A)
Extract air:											
To surroundings	53	61	44	35	34	33	25	16	dB	46	dB(A)
Extract air	51	60	50	48	41	35	23	13	dB	49	dB(A)
Exhaust air	57	69	64	64	66	63	56	52	dB	70	dB(A)
Total:											
To surroundings	56	64	47	39	38	36	28	19	dB	49	dB(A)

ECODAN MONOBLOC ASHP		PUHZ-W50VHA2(-BS)	PUHZ-W85VAA(-BS)	PUHZ-W112VAA(-BS)	PUHZ-HW140VHA2(-BS)	PUHZ-HW140VHA2(-BS)
HEAT PUMP SPACE HEATER - 55°C	ErP Rating	A++	A++	A++	A++	A++
	η_{hp}	127%	137%	133%	126%	126%
	SCOP	3.25	3.50	3.40	3.22	3.22
HEAT PUMP SPACE HEATER - 35°C	ErP Rating	A++	A++	A++	A++	A++
	η_{hp}	162%	171%	170%	157%	157%
	SCOP	4.12	4.35	4.34	3.99	3.99
HEAT PUMP COMBINATION HEATER - Large Profile ¹	ErP Rating	A	A	A	A	A
	η_{hp}	99%	104%	100%	96%	96%
	COF	2.95	2.90	2.95	2.91	2.91
HEATING ² (A-3/W35)	Capacity (kW)	4.8	8.3	11.0	14.0	14.0
	Power Input (kW)	1.63	2.86	3.73	4.81	4.81
	COF	2.95	2.90	2.95	2.91	2.91
OPERATING AMBIENT TEMPERATURE (°C DB)		-15 ~ +35°C	-20 ~ +35°C	-20 ~ +35°C	-25 ~ +35°C	-25 ~ +35°C
SOUND PRESSURE LEVEL AT 1M (dBA) ^{3,4}		45	45	47	53	53
LOW NOISE MODE (dBA) ^{3,4}		40	58	60	60	60
WATER DATA	Pipework Size (mm)	22	28	28	28	28
	Flow Rate (l/min)	14.3	25.8	32.1	40.1	40.1
	Water Pressure Drop (kPa)	12	16.1	24.4	9	9
DIMENSIONS (mm) ⁷	Width	950	1050	1050	1020	1020
	Depth	330+30 ⁸	480	480	330+30 ⁸	330+30 ⁸
	Height	740	1020	1020	1350	1350
WEIGHT (kg)		64	97	118	134	148
ELECTRICAL DATA	Electrical Supply	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz	380-415v, 50Hz
	Phase	Single	Single	Single	Single	3
	Nominal Running Current (MAX) (A)	5.4 [13]	9.1 [22.0]	10.9 [28.0]	14.9 [35]	5.1 [13]
	Fuse Rating - MCB Sizes (A) ⁹	16	25	32	40	16

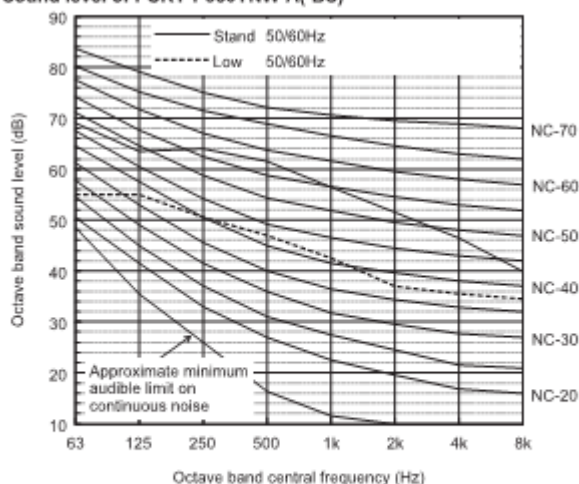
¹ Combination with EHPT20K-MHCW Cylinder ² Under normal heating conditions at outdoor temp: -3°CDB / -4°CWB, outlet water temp 35°C, inlet water temp 30°C.

³ Under normal heating conditions at outdoor temp: 7°CDB / 6°CWB, outlet water temp 35°C, inlet water temp 30°C as tested to BS EN14511.

⁴ Sound power level of the PUHZ-W50VHA2 is 61dBA, PUHZ-W85VHA2 is 62.5dBA, PUHZ-W112VHA is 65dBA, PUHZ-HW140VHA2 is 67.5dBA. Tested to BS EN12102.

⁵ Gills. ⁶ MCB Sizes BS EN60898-2 & BS EN60947-2. ⁷ Flow Temperature Controller (FTC) for standalone systems PAC-F002B-E Dimensions WxDxH (mm) - 520x100x50

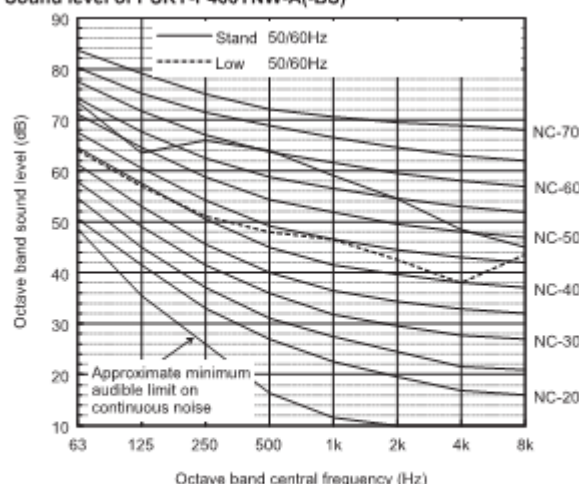
Sound level of PURY-P350YNW-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	69.0	63.5	64.0	61.5	56.5	51.5	46.5	40.0	62.5
Low noise mode	50/60Hz	55.0	55.0	50.5	47.0	42.5	37.0	35.5	34.5	49.0

When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

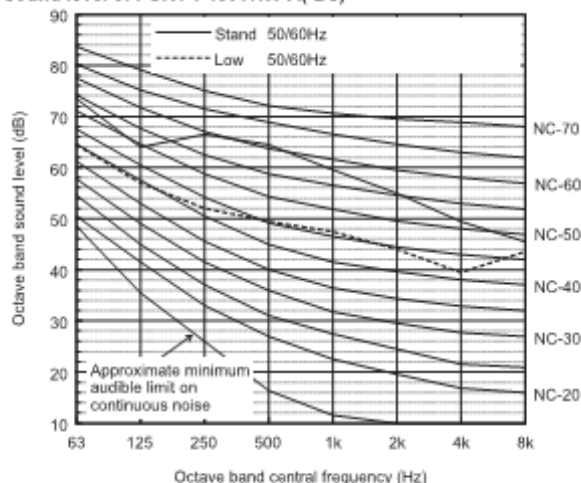
Sound level of PURY-P400YNW-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	73.5	63.5	66.0	64.0	59.0	54.5	49.5	45.0	65.0
Low noise mode	50/60Hz	64.0	57.0	51.0	48.0	46.5	42.5	38.0	43.5	52.0

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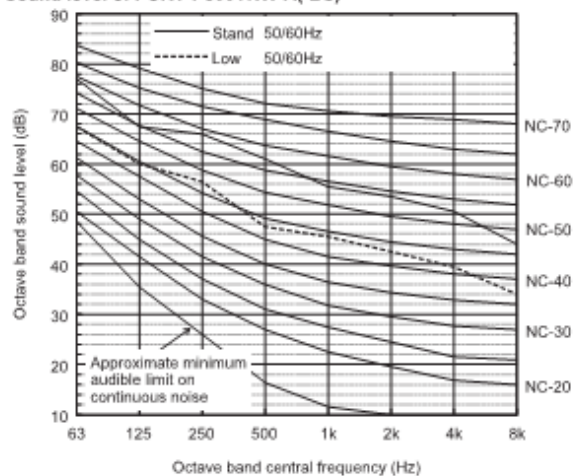
Sound level of PURY-P450YNW-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	73.5	64.0	66.5	64.5	59.5	55.0	49.5	45.5	65.5
Low noise mode	50/60Hz	64.5	57.0	52.0	49.5	47.5	44.0	39.5	43.5	53.0

When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.

Sound level of PURY-P500YNW-A(-BS)



		63	125	250	500	1k	2k	4k	8k	dB(A)
Standard	50/60Hz	77.0	67.5	66.0	61.0	55.5	53.5	50.5	44.0	63.5
Low noise mode	50/60Hz	67.5	60.0	56.5	47.5	45.5	42.5	39.5	34.0	53.0

When Low noise mode is set, the A/C system's capacity is limited. The system could return to normal operation from Low noise mode automatically in the case that the operation condition is severe.



SUMMARY FAN DATA SHEET

Nuaire, Western Industrial Estate, Caerphilly, CF83 1NA, United Kingdom. email:info@nuaire.co.uk
UK Commercial enquiries T:029 2085 8200 UK Residential enquiries T:029 2085 8500 International enquiries T:+44.29 2085 8497
Whilst the information given on this data sheet is fan specific, it is in summary and reference to the product selection catalogue and installation & maintenance documents is recommended.
This data sheet produced on 12 Aug 2021 15:53 using software version 4.7.4036.0

Project Details

Location: MVHR-GF-01 Showers

Technical Data

XBC+

Fan Code: **XBC55HA-NNN-C-LS1S**
Installation Manual Links: 671954

Required duty: 0.388 m³/s at 161 Pa
Actual duty: 0.485 m³/s at 252 Pa
Actual at required flow: 0.388 m³/s at 402 Pa

When speed controlled to required duty (79.94%):

Motor Input Power: **0.485 kW**
Specific Fan Power: **1.2 W/(l/s)**

At full speed:

Motor Input Power: 0.949 kW
Specific Fan Power: 2.0 W/(l/s)

Maximum Fan Speed: 2,400 RPM
Electrical Supply: 230V, 1 Phase, 50 Hz
Nominal Motor Rating: 1 kW
Motor current (flc): 5.1 A
Motor starting current (sc): 5.1 A

Max. operating temp: 45°C
Weight: 375 kg

Sound Data

Noise calculated speed controlled to required duty (79.94%)

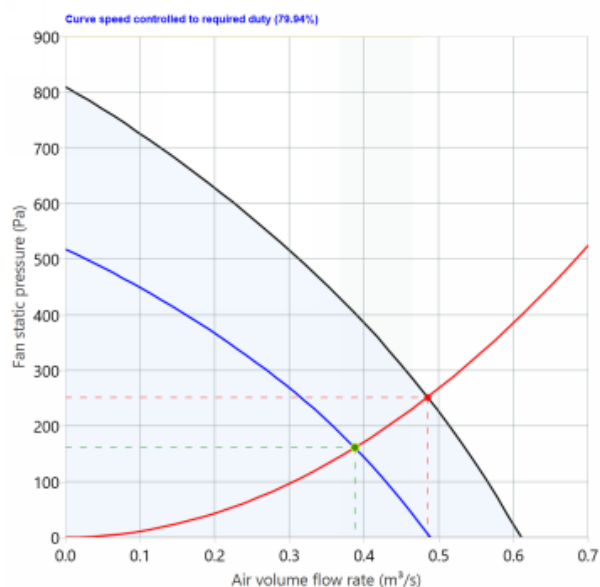
Sound Power Levels re 1 pWatts (Hz):

Hz	63	125	250	500	1k	2k	4k	8k	dB(A)
Breakout	67	61	54	40	39	36	32	21	29
Induct Intake	76	70	68	56	58	54	45	34	43
Induct Supply	80	76	77	64	66	63	58	54	51
Induct Discharge	81	77	77	64	66	64	58	56	51
Induct Extract	77	71	68	56	58	55	45	36	43
For 100% speed:	+5	+4	+7	+7	+6	+7	+8	+7	

dB(A) is spherical at 3 metres. For hemi-spherical add 3 dB(A).

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

Performance Chart

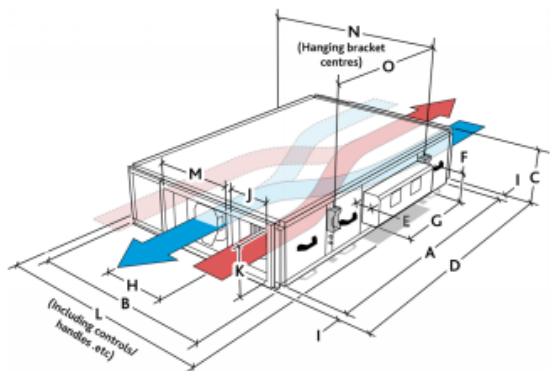


Additional Notes

Specification

XBC55HA-NNN-C-LS1S. Nuaire XBOXER Supply & Extract HX unit. Incorporating high efficiency Counterflow plate heat exchanger 100% bypass facility (patent app. for) automatic control and actuator. Backward curved impellers, IP54 EC motors and speed control. Double skinned construction (patented). G4 Supply G4 Extract panel filters (spares included). EcoSmart Connect control of ventilation/heating, allowing unitary control and full BMS integration via BACnet MS/TP (integration by others). System includes a EcoSmart Connect Control which is pre-configured and the unit/control assembly is functionally tested at works. For ceiling/underfloor/slab mounted applications. Supply/Discharge connections on unit centreline; Intake/Extract connections are configurable on site to either side of unit. Rotational side mounted control. Unit will be supplied LEFT HANDED. 5 year warranty (UK and Ireland only)

Fan Dimensions



A	B	C	D	E	F	G	H	I
1900	1560	470	1960	140	210	640	535	30
J	K	L	M	N	O	P	Q	R
397	430	1751	587	1632	1052	375.0		
Length: Width: Height:								
1900 1560 470								

Drawing is for dimensional purposes only. Dimensions in mm.



SUMMARY FAN DATA SHEET

Nuaire, Western Industrial Estate, Caerphilly, CF83 1NA, United Kingdom. email:info@nuaire.co.uk
UK Commercial enquiries T:029 2085 8200 UK Residential enquiries T:029 2085 8500 International enquiries T:+44.29 2085 8497
Whilst the information given on this data sheet is fan specific, it is in summary and reference to the product selection catalogue and installation & maintenance documents is recommended.
This data sheet produced on 12 Aug 2021 15:53 using software version 4.7.4036.0

Project Details

Location: MVHR-MZ-01 Maker Space M01

Technical Data

XBC+
Fan Code: **XBC45HA-NNN-C-LB1S**
Installation Manual Links: 671954
Required duty: 0.34 m³/s at 106 Pa
Actual duty: 0.447 m³/s at 184 Pa
Actual at required flow: 0.34 m³/s at 385 Pa
When speed controlled to required duty (76.01%):
Motor Input Power: 0.414 kW
Specific Fan Power: 1.2 W/(l/s)
At full speed:
Motor Input Power: 0.942 kW
Specific Fan Power: 2.1 W/(l/s)
Maximum Fan Speed: 2,400 RPM
Electrical Supply: 230V, 1 Phase, 50 Hz
Nominal Motor Rating: 1 kW
Motor current (flc): 5.1 A
Motor starting current (sc): 5.1 A
Max. operating temp: 45°C
Weight: 298 kg

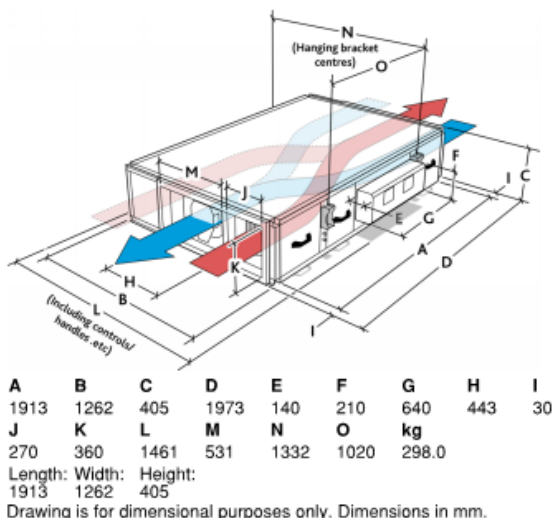
Sound Data

Noise calculated speed controlled to required duty (76.01%)
Sound Power Levels re 1 pWatts (Hz):
Hz 63 125 250 500 1k 2k 4k 8k dBA
Breakout 68 59 56 41 39 38 34 23 29
Induct Intake 77 69 69 58 58 56 48 39 43
Induct Supply 81 74 79 65 66 65 60 56 52
Induct Discharge 82 75 79 65 66 66 60 58 52
Induct Extract 78 69 70 57 58 57 47 38 44
For 100% speed: +6 +6 +6 +6 +6 +6 +6 +6 +6

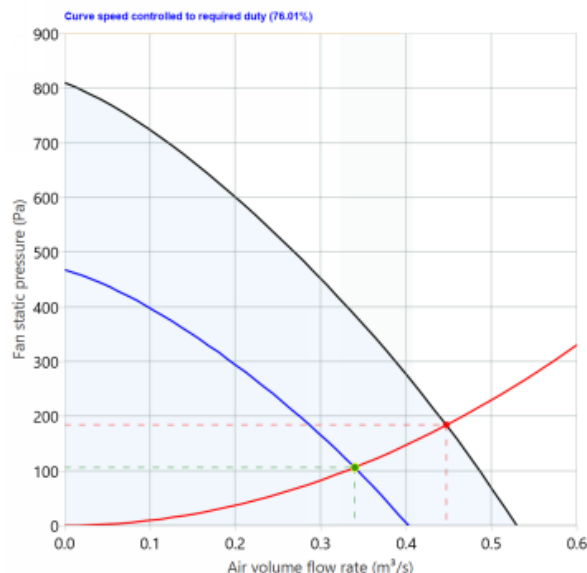
dBA is spherical at 3 metres. For hemi-spherical add 3 dBA.

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

Fan Dimensions



Performance Chart



Additional Notes

Specification

XBC45HA-NNN-C-LB1S. Nuaire XBOXER Supply & Extract HX unit. Incorporating high efficiency Counterflow plate heat exchanger 100% bypass facility (patent app. for) automatic control and actuator. Backward curved impellers, IP54 EC motors and speed control. Double skinned construction (patented). G4 Supply G4 Extract panel filters (spares included). EcoSmart Connect control of ventilation/heating, allowing unitary control and full BMS integration via BACnet MS/TP (integration by others). System includes a EcoSmart Connect Control which is pre-configured and the unit/control assembly is functionally tested at works. For ceiling/underfloor/slab mounted applications. Supply/Discharge connections on unit centreline; Intake/Extract connections are configurable on site to either side of unit. Rotational side mounted control. Unit will be supplied LEFT HANDED with bottom access for filter removal and replacement. 5 year warranty (UK and Ireland only)



SUMMARY FAN DATA SHEET

Nuaire, Western Industrial Estate, Caerphilly, CF83 1NA, United Kingdom. email: info@nuaire.co.uk

UK Commercial enquiries T:029 2085 8200 UK Residential enquiries T:029 2085 8500 International enquiries T:+44.29 2085 8497

Whilst the information given on this data sheet is fan specific, it is in summary and reference to the product selection catalogue and installation & maintenance documents is recommended.

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Project Details

Location: MVHR-MZ-02 Maker Space M02

Technical Data

XBC+

Fan Code: **XBC25HA-NNN-C-LB1S**
Installation Manual Links: 671954

Required duty: 0.24 m³/s at 96 Pa
Actual duty: 0.364 m³/s at 221 Pa
Actual at required flow: 0.24 m³/s at 654 Pa

When speed controlled to required duty (65.89%):

Motor Input Power: 0.285 kW
Specific Fan Power: 1.2 W/(l/s)

At full speed:

Motor Input Power: 0.995 kW
Specific Fan Power: 2.7 W/(l/s)

Maximum Fan Speed: 3,740 RPM
Electrical Supply: 230V, 1 Phase, 50 Hz
Nominal Motor Rating: 1 kW
Motor current (flc): 5.1 A
Motor starting current (sc): 5.1 A

Max. operating temp: 60°C
Weight: 242 kg

Sound Data

Noise calculated speed controlled to required duty (65.89%)

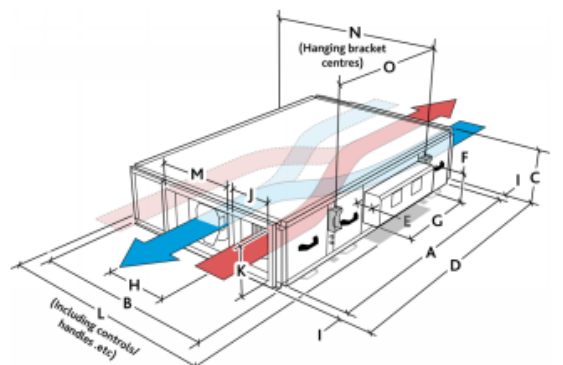
Sound Power Levels re 1 pWatts (Hz):

Hz	63	125	250	500	1k	2k	4k	8k	dBA
Breakout	62	61	48	51	38	37	37	29	30
Induct Intake	70	64	62	64	59	55	47	46	44
Induct Supply	75	76	71	75	65	65	61	63	54
Induct Discharge	76	77	71	74	65	65	63	64	54
Induct Extract	69	63	61	64	58	55	47	47	44
For 100% speed:	+10	+10	+10	+10	+10	+10	+10	+10	

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

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

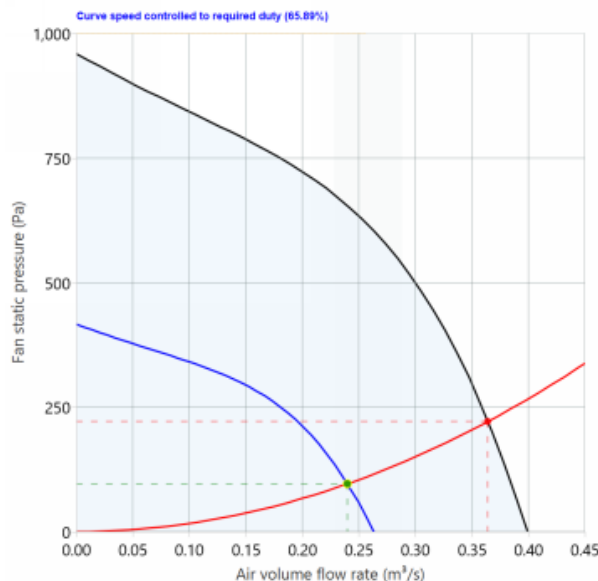
Fan Dimensions



A	B	C	D	E	F	G	H	I
1713	1160	346	1773	140	210	640	413	30
J	K	L	M	N	O	kg		
252	302	1350	471	1232	884	242.0		
Length:	Width:	Height:						
1713	1160	346						

Drawing is for dimensional purposes only. Dimensions in mm.

Performance Chart



Additional Notes

Specification

XBC25HA-NNN-C-LB1S. Nuaire XBOXER Supply & Extract HX unit. Incorporating high efficiency Counterflow plate heat exchanger 100% bypass facility (patent app. for) automatic control and actuator. Backward curved impellers, IP54 EC motors and speed control. Double skinned construction (patented). G4 Supply G4 Extract panel filters (spares included). EcoSmart Connect control of ventilation/heating, allowing unitary control and full BMS integration via BACnet MS/TP (integration by others). System includes a EcoSmart Connect Control which is pre-configured and the unit/control assembly is functionally tested at works. For ceiling/underfloor/slab mounted applications. Supply/Discharge connections on unit centreline; Intake/Extract connections are configurable on site to either side of unit. Rotational side mounted control. Unit will be supplied LEFT HANDED with bottom access for filter removal and replacement. 5 year warranty (UK and Ireland only)



SUMMARY FAN DATA SHEET

Nuaire, Western Industrial Estate, Caerphilly, CF83 1NA, United Kingdom. email: info@nuaire.co.uk

UK Commercial enquiries T: 029 2085 8200 UK Residential enquiries T: 029 2085 8500 International enquiries T: +44 29 2085 8497

Whilst the information given on this data sheet is fan specific, it is in summary and reference to the product selection catalogue and installation & maintenance documents is recommended.

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Project Details

Location: MVHR-MZ-03 Maker Space M03

Technical Data

XBC+

Fan Code: **XBC25HA-NNN-C-LB1S**
Installation Manual Links: 671954

Required duty: 0.14 m³/s at 91 Pa
Actual duty: 0.313 m³/s at 455 Pa
Actual at required flow: 0.14 m³/s at 799 Pa

When speed controlled to required duty (44.72%):

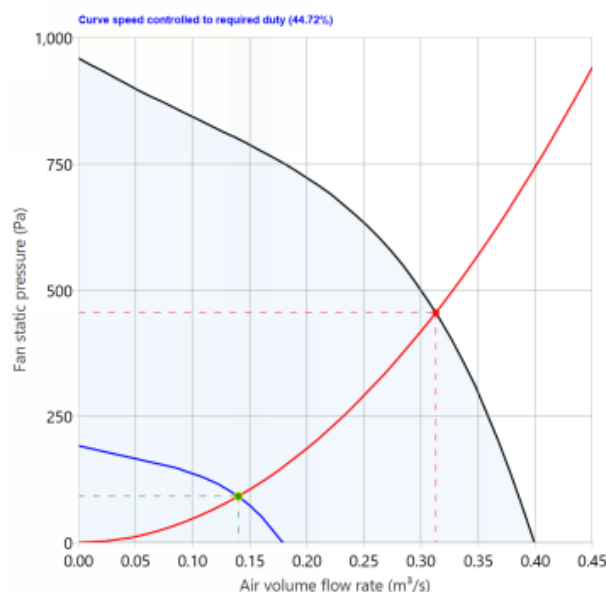
Motor Input Power: **0.088 kW**
Specific Fan Power: **0.6 W/(l/s)**

At full speed:

Motor Input Power: 0.98 kW
Specific Fan Power: 3.1 W/(l/s)
Maximum Fan Speed: 3,740 RPM
Electrical Supply: 230V, 1 Phase, 50 Hz
Nominal Motor Rating: 1 kW
Motor current (fic): 5.1 A
Motor starting current (sc): 5.1 A

Max. operating temp: 60°C
Weight: 242 kg

Performance Chart



Sound Data

Noise calculated speed controlled to required duty (44.72%)

Hz	63	125	250	500	1k	2k	4k	8k	dBA
Breakout	54	53	40	43	30	29	29	21	22
Induct Intake	62	56	54	56	51	47	39	38	36
Induct Supply	67	68	63	67	57	57	53	55	46
Induct Discharge	68	69	63	66	57	57	55	56	45
Induct Extract	61	55	53	56	50	47	39	39	35

For 100% speed: +18 +18 +18 +18 +18 +18 +18 +18

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

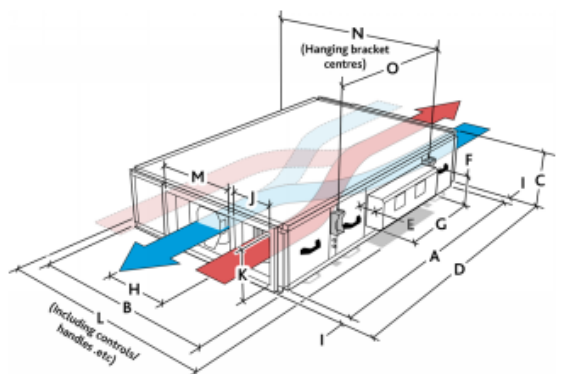
Please note that the noise data stated on this data sheet for the unit and/or silencer is tested in accordance with UK, European and International industry laboratory standards. However onsite conditions may vary and we would recommend that this information is verified by an acoustic specialist in order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

Additional Notes

Specification

XBC25HA-NNN-C-LB1S. Nuaire XBOXER Supply & Extract HX unit. Incorporating high efficiency Counterflow plate heat exchanger 100% bypass facility (patent app. for) automatic control and actuator. Backward curved impellers, IP54 EC motors and speed control. Double skinned construction (patented). G4 Supply G4 Extract panel filters (spares included). EcoSmart Connect control of ventilation/heating, allowing unitary control and full BMS integration via BACnet MS/TP (integration by others). System includes a EcoSmart Connect Control which is pre-configured and the unit/control assembly is functionally tested at works. For ceiling/underfloor/slab mounted applications. Supply/Discharge connections on unit centreline; Intake/Extract connections are configurable on site to either side of unit. Rotational side mounted control. Unit will be supplied LEFT HANDED with bottom access for filter removal and replacement. 5 year warranty (UK and Ireland only)

Fan Dimensions



A	B	C	D	E	F	G	H	I
1713	1160	346	1773	140	210	640	413	30
J	K	L	M	N	O	kg		
252	302	1350	471	1232	884	242.0		
Length: Width: Height:								
1713	1160	346						

Drawing is for dimensional purposes only. Dimensions in mm.



SUMMARY FAN DATA SHEET

Nuaire, Western Industrial Estate, Caerphilly, CF83 1NA, United Kingdom. email: info@nuaire.co.uk
UK Commercial enquiries T:029 2085 8200 UK Residential enquiries T:029 2085 8500 International enquiries T:+44.29 2085 8497
Whilst the information given on this data sheet is fan specific, it is in summary and reference to the product selection catalogue and installation & maintenance documents is recommended.
This data sheet produced on 12 Aug 2021 15:53 using software version 4.7.4036.0

Project Details

Location: MVHR-MZ-04 Maker Space M04

Technical Data

XBC+
Fan Code: **XBC25HA-NNN-C-LB1S**
Installation Manual Links: 671954
Required duty: 0.24 m³/s at 96 Pa
Actual duty: 0.364 m³/s at 221 Pa
Actual at required flow: 0.24 m³/s at 654 Pa
When speed controlled to required duty (65.89%):
Motor Input Power: 0.285 kW
Specific Fan Power: 1.2 W/(l/s)
At full speed:
Motor Input Power: 0.995 kW
Specific Fan Power: 2.7 W/(l/s)
Maximum Fan Speed: 3,740 RPM
Electrical Supply: 230V, 1 Phase, 50 Hz
Nominal Motor Rating: 1 kW
Motor current (flc): 5.1 A
Motor starting current (sc): 5.1 A
Max. operating temp: 60°C
Weight: 242 kg

Sound Data

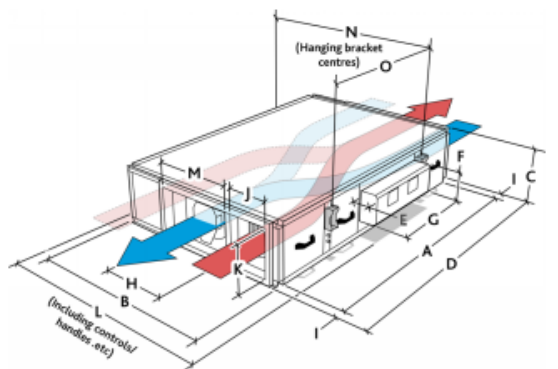
Noise calculated speed controlled to required duty (65.89%)

Hz	63	125	250	500	1k	2k	4k	8k	dBA
Breakout	62	61	48	51	38	37	37	29	30
Induct Intake	70	64	62	64	59	55	47	46	44
Induct Supply	75	76	71	75	65	65	61	63	54
Induct Discharge	76	77	71	74	65	65	63	64	54
Induct Extract	69	63	61	64	58	55	47	47	44
For 100% speed:	+10	+10	+10	+10	+10	+10	+10	+10	

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

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

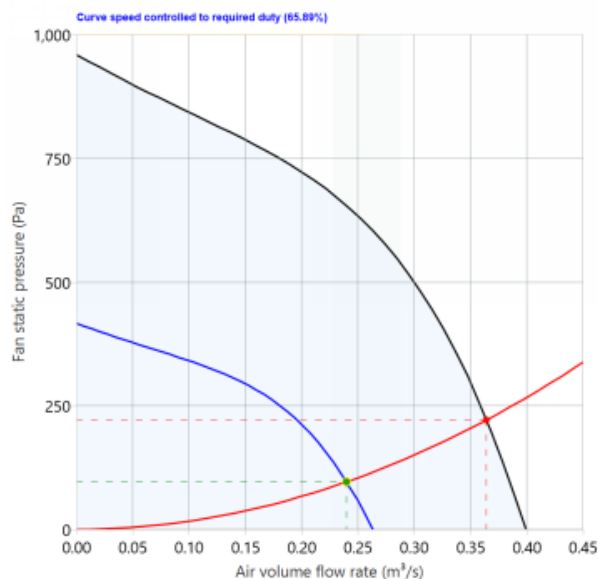
Fan Dimensions



A	B	C	D	E	F	G	H	I
1713	1160	346	1773	140	210	640	413	30
J	K	L	M	N	O	kg		
252	302	1350	471	1232	884	242.0		
Length:	Width:	Height:						
1713	1160	346						

Drawing is for dimensional purposes only. Dimensions in mm.

Performance Chart



Additional Notes

Specification

XBC25HA-NNN-C-LB1S. Nuaire XBOXER Supply & Extract HX unit. Incorporating high efficiency Counterflow plate heat exchanger 100% bypass facility (patent app. for) automatic control and actuator. Backward curved impellers, IP54 EC motors and speed control. Double skinned construction (patented). G4 Supply G4 Extract panel filters (spares included). EcoSmart Connect control of ventilation/heating, allowing unitary control and full BMS integration via BACnet MS/TP (integration by others). System includes a EcoSmart Connect Control which is pre-configured and the unit/control assembly is functionally tested at works. For ceiling/underfloor/slab mounted applications. Supply/Discharge connections on unit centreline; Intake/Extract connections are configurable on site to either side of unit. Rotational side mounted control. Unit will be supplied LEFT HANDED with bottom access for filter removal and replacement. 5 year warranty (UK and Ireland only)

Base Building, Manchester
External Plant Noise Assessment
SBE Ref. PRO-062587 AC 1v1



PROJECT NAME: THE BASE BUILDING- MANCHESTER SCIENCE PARK
DATE: 09/06/2021
PROJECT No: 72704
SCHEDULE No: 14072704Q4

Item	System Reference	Code	Suffix	DWG	L1 mm	L2/ID mm	W mm	H/Dia mm	Vol m³/s	PD Pa	Wt kg	No. Off.	Performance, dB								
													63	125	250	500	1k	2k	4k	8k	
1	ATT-GF-01 REF-GF-01 DISCH	PL	G	A13G	900	250			0.207	5	12	1	IL	2	3	7	18	25	19	17	13
2	ATT-GF-02 REF-GF-01 EXTRACT	PL	G	A13G	900	250			0.207	5	12	1	IL	2	3	7	18	25	19	17	13
3	ATT-GF-03 ASSUMED SUPPLIED BY PLANT MANUFACTURER																				
4	ATT-GF-04 REFERENCE NOT USED																				
5	ATT-GF-05 MVHR-GF-01 EXTRACT	SL	GJ	A02G	900		400	200	0.324	30	21	1	IL	2	5	11	24	46	42	36	22
6	ATT-GF-06 MVHR-GF-01 SUPPLY	SL	GJ	A02G	900		400	200	0.324	30	21	1	IL	2	5	11	24	46	42	36	22
7	ATT-GF-07 MVHR-GF-01 FAI	SL	GJ	A02G	900		400	200	0.324	30	21	1	IL	2	5	11	24	46	42	36	22
8	ATT-GF-08 MVHR-GF-01 DISCH	SL	GJ	A02G	900		400	200	0.324	30	21	1	IL	2	5	11	24	46	42	36	22
9	OMITTED																				
10	OMITTED																				
11	OMITTED																				
12	OMITTED																				
13	OMITTED																				
14	OMITTED																				
15	OMITTED																				
16	ATT-GF-16 OFFICE EXTRACT	SL	GJN	A05G	900		500	200	0.168	10	18	1	IL	2	5	11	24	46	42	36	22
17	ATT-GF-17 OFFICE EXTRACT	SL	GJN	A05G	900		500	200	0.168	10	18	1	IL	2	5	11	24	46	42	36	22
18	ATT-GF-18 OFFICE EXTRACT	SL	GJN	A05G	900		300	200	0.096	10	12	1	IL	2	5	11	24	46	42	36	22
19	ATT-GF-19 OFFICE EXTRACT	SL	GJN	A05G	900		500	200	0.168	10	18	1	IL	2	5	11	24	46	42	36	22
20	ATT-GF-20 OFFICE EXTRACT	SL	GJN	A05G	900		500	200	0.168	10	18	1	IL	2	5	11	24	46	42	36	22
21	ATT-GF-21 OFFICE EXTRACT	SL	GJN	A05G	900		500	200	0.168	10	18	1	IL	2	5	11	24	46	42	36	22
22	ATT-GF-22 OFFICE EXTRACT	SL	GJN	A05G	900		400	200	0.132	10	14	1	IL	2	5	11	24	46	42	36	22
23	CTA-GF-01 6 PER MTG RM SUPPLY	PL	G	A13G	900	200			0.06	5	10	1	IL	1	3	7	19	28	23	20	15
24	CTA-GF-02 6 PER MTG RM EXTRACT	PL	G	A13G	900	200			0.06	5	10	1	IL	1	3	7	19	28	23	20	15
25																					
26	ATT-MZ-01 MVHR-MZ-01 DISCH	SL	GJ	A02G	900		500	200	0.34	30	25	1	IL	2	5	11	24	46	42	36	22
27	ATT-MZ-02 MVHR-MZ-01 FAI	SL	GJ	A02G	900		500	200	0.34	30	25	1	IL	2	5	11	24	46	42	36	22
28	ATT-MZ-03 MVHR-MZ-01 SUP	SL	GJ	A02G	1200		500	200	0.34	30	31	1	IL	3	7	14	30	55	53	46	28
29	ATT-MZ-04 MVHR-MZ-01 EXT	SL	GJ	A02G	1200		500	200	0.34	30	31	1	IL	3	7	14	30	55	53	46	28
30	ATT-MZ-05 MVHR-MZ-02 DISCH	SL	GJ	A02G	900		500	200	0.24	30	25	1	IL	2	5	11	24	46	42	36	22
31	ATT-MZ-06 MVHR-MZ-02 FAI	SL	GJ	A02G	900		500	200	0.24	30	25	1	IL	2	5	11	24	46	42	36	22
32	ATT-MZ-07 MVHR-MZ-02 SUP	SL	GJ	A02G	1200		500	200	0.24	30	31	1	IL	3	7	14	30	55	53	46	28
33	ATT-MZ-08 MVHR-MZ-02 EXT	SL	GJ	A02G	1200		500	200	0.24	30	31	1	IL	3	7	14	30	55	53	46	28
34	ATT-MZ-09 MVHR-MZ-03 DISCH	SL	GJ	A02G	900		350	200	0.14	30	20	1	IL	2	5	11	24	46	42	36	22
35	ATT-MZ-10 MVHR-MZ-03 FAI	SL	GJ	A02G	900		350	200	0.14	30	20	1	IL	2	5	11	24	46	42	36	22
36	ATT-MZ-11 MVHR-MZ-03 SUP	SL	GJ	A02G	900		350	200	0.14	30	20	1	IL	2	5	11	24	46	42	36	22

ALLWAY ACOUSTICS Old Police Station, 1 Queens Road, Hertford SG14 1EN
T | 01992 550825 E | enquiries@allwayacoustics.co.uk W | allwayacoustics.co.uk
Registered in England No. 958950. Registered office: 1 Queens Road, Hertford SG14 1EN

Page: 1 of 3



PROJECT NAME: THE BASE BUILDING- MANCHESTER SCIENCE PARK
DATE: 09/06/2021
PROJECT No: 72704
SCHEDULE No: 14072704Q4

Item	System Reference	Code	Suffix	DWG	L1	L2/ID	W	H/Dia	Vol	PD	Wt	No.		Performance, dB									
37	ATT-MZ-12 MVHR-MZ-03 EXT	SL	GJ	A02G	900		350	200	0.14	30	20	1	IL	2	5	11	24	46	42	36	22		
38	ATT-MZ-13 MVHR-MZ-04 DISCH	SL	GJ	A02G	900		500	200	0.24	30	25	1	IL	2	5	11	24	46	42	36	22		
39	ATT-MZ-14 MVHR-MZ-04 FAI	SL	GJ	A02G	900		500	200	0.24	30	25	1	IL	2	5	11	24	46	42	36	22		
40	ATT-MZ-15 MVHR-MZ-04 SUP	SL	GJ	A02G	1200		500	200	0.24	30	31	1	IL	3	7	14	30	55	53	46	28		
41	ATT-MZ-16 MVHR-MZ-04 EXT	SL	GJ	A02G	1200		500	200	0.24	30	31	1	IL	3	7	14	30	55	53	46	28		
42	ATT-MZ-17 ASSUMED SUPPLIED BY PLANT MANUFACTURER																						
43	ATT-MZ-18 REFERENCE NOT USED																						
44	ATT-MZ-19 REFERENCE NOT USED																						
45	ATT-MZ-20 REFERENCE NOT USED																						
46	ATT-MZ-21 REFERENCE NOT USED																						
47	ATT-MZ-22 REFERENCE NOT USED																						
48	ATT-MZ-23 ASSUMED SUPPLIED BY PLANT MANUFACTURER																						
49	ATT-MZ-24 ASSUMED SUPPLIED BY PLANT MANUFACTURER																						
50	OMITTED																						
51	OMITTED																						
52	ATT-MZ-27 OFFICE EXTRACT	SL	GJN	A05G	900		800	400	0.612	10	35	1	IL	6	11	18	26	35	30	25	16		
53	ATT-MZ-28 OFFICE EXTRACT	SP	GN	A05G	900		500	500	0.468	10	31	1	IL	4	9	16	28	48	42	36	22		
54																							
55	ATT-01-01 TO ATT-01-12 OMITTED																						
56	ATT-02-01 TO ATT-02-12 OMITTED																						
57	ATT-03-01 TO ATT-03-12 OMITTED																						
58	ATT-04-01 TO ATT-04-12 OMITTED																						
59																							
60	ATT-RF-01 AHU-RF-01 SUP	SP	G	A02G	1200		1550	700	7.01	50	139	1	IL	8	14	20	27	36	23	19	12		
61	ATT-RF-02 AHU-RF-01 EXT	SP	G	A02G	1200		1550	700	7.01	50	139	1	IL	8	14	20	27	36	23	19	12		
62	ATT-RF-03 AHU-RF-01 FAI	SP	G	A02G	900		1900	700	7.01	50	138	1	IL	7	11	17	22	30	21	17	11		
63	ATT-RF-04 AHU-RF-01 DISCH	SP	G	A02G	900		1900	700	7.01	50	138	1	IL	7	11	17	22	30	21	17	11		
64	ATT-RF-05 AHU-RF-02 SUP	SP	G	A02G	1200		1800	700	7.37	50	170	1	IL	8	13	20	25	33	21	17	11		
65	ATT-RF-06 AHU-RF-02 EXT	SP	G	A02G	1200		1800	700	7.37	50	170	1	IL	8	13	20	25	33	21	17	11		
66	ATT-RF-07 AHU-RF-02 FAI	SP	G	A02G	900		1900	700	7.37	50	138	1	IL	6	10	16	20	27	17	13	9		
67	ATT-RF-08 AHU-RF-02 DISCH	SP	G	A02G	900		1900	700	7.37	50	138	1	IL	6	10	16	20	27	17	13	9		
68	ATT-RF-09 AHU-RF-03 SUP	SL	GJ	A02G	1200		350	350	0.63	50	32	1	IL	6	12	20	33	44	37	32	17		
69	ATT-RF-10 AHU-RF-03 EXT	SL	GJ	A02G	1200		350	350	0.63	50	32	1	IL	6	12	20	33	44	37	32	17		
70	ATT-RF-11 AHU-RF-03 FAI	SL	GJ	A02G	900		350	350	0.63	50	25	1	IL	5	9	16	26	37	30	26	16		
71	ATT-RF-12 AHU-RF-03 DISCH	SL	GJ	A02G	900		350	350	0.63	50	25	1	IL	5	9	16	26	37	30	26	16		
72	ATT-RF-13 AHU-RF-04 SUP	SL	GE	A18G	1200	355	505	410	0.324	20	48	1	IL	8	14	21	29	33	27	22	11		
73	ATT-RF-14 AHU-RF-04 EXT	SL	GE	A18G	1200	355	505	410	0.432	20	48	1	IL	8	14	21	29	33	27	22	11		

Base Building, Manchester
External Plant Noise Assessment
SBE Ref. PRO-062587 AC 1v1



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74	ATT-RF-15 AHU-RF-04 FAI	SL	GE	A18G	900	355	505	410	0.324	20	40	1	IL	7	10	17	22	27	22	18	10	
75	ATT-RF-16 AHU-RF-04 DISCH	SL	GE	A18G	900	355	505	410	0.432	20	40	1	IL	7	10	17	22	27	22	18	10	

NOTES:

LABEL WITH ITEM NO. & SYSTEM REF.

IL = STATIC INSERTION LOSS (dB)

G - SELF FINISH PRE-GALVANISED STEEL CONSTRUCTION.

J - SPLITTERS ARRANGED HORIZONTALLY.

N - PLAIN ENDS (NO FLANGES).

E - RECTANGULAR ATTENUATOR SUPPLIED C/W CIRCULAR SPIGOT END CONNECTIONS. SPIGOT SIZE IN L2/D COLUMN ABOVE.

WE HAVE ASSUMED PLAIN ENDED CONNECTIONS ON ATTENUATORS WHICH ARE TO MATCH GRILLES. SHOULD FLANGES BE REQUIRED PLEASE CONFIRM.

SELECTIONS BASED ON HURSTWOOD CONSULTING SCHEDULE REV C4 DATED APRIL 2021.

ALLAWAY ACOUSTICS Old Police Station, 1 Queens Road, Hertford SG14 1EN
T | 01992 550825 E | enquiries@allawayacoustics.co.uk W | allawayacoustics.co.uk
Registered in England No. 958950. Registered office: 1 Queens Road, Hertford SG14 1EN

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Appendix IV. Acoustic Glossary

Sound pressure level and the decibel, dB

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. The decibel is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

Frequency and hertz, Hz

Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz. The human range of hearing is commonly accepted to be 20 Hz to 20,000 Hz. Additionally, an octave can be used to describe the interval between a frequency in Hz and either half or double that frequency.

Frequency weighting

Different weighting networks can be applied to a given sound level in each stated octave band by a specified amount, in order to better represent the response of the human ear. The most commonly used weighting network is the 'A' weighting, and the letter 'A' will be included within a descriptor to indicate that the value has been 'A' weighted, e.g. $L_{Aeq,T}$ or L_{A90} . An 'A' weighted noise level may also be written as dB(A). Other weightings less commonly used are 'C' and 'D' weighting.

Noise indices

When a noise level varies with time, the measured 'A' weighted dB level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple 'A' weighted dB value. In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The various indices used are described as below:

$L_{Aeq,T}$	The 'A' weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period, T
L_{Amax}	The maximum 'A' weighted noise level that was recorded during the monitoring period.
L_{A10}	The 'A' weighted noise level that was recorded for at least 10% of the monitoring period.
L_{A90}	The 'A' weighted noise level that was recorded for at least 90% of the monitoring period, usually taken as the underlying 'background' noise level.

Sound level difference, D

The sound level difference between two internal spaces, or between internal and external spaces. The ' D ' value is used to denote the differences at each third octave or octave band, with a single figure 'weighted' value to

describe an overall performance. Note that the 'D' value will always describe an in-situ or on-site acoustic performance. All values are described using the decibel.

D_w	Single figure weighted sound level difference, simply the measured source noise level minus receiver noise level, not adjusted to reference conditions
$D_{nT,w}$	Weighted normalised sound level difference – a single, weighted sound insulation value, normalised to a reference reverberation time using the measured reverberation time in the receive room
$D_{nT,w} + C_{tr}$	As above, with a spectral adaptation term applied to account for the effects of low frequency noise, and based on urban traffic noise
$D_{nf,w}$	Overall flanking normalised level difference - A parameter that defines the flanking transmission of sound from room to room where a dividing partition or floor construction abuts a flanking building element common to both rooms, such as the building façade or ceiling

Sound reduction index, R

This describes the sound transmitted through a material or building element, such as a wall, door or window. It is measured in a laboratory with suppressed flanking transmission. The 'R' value is used to denote the differences at each third octave or octave band, with a single figure 'weighted' value to describe an overall performance. All values are described using the decibel.

R_w	Weighted single figure sound reduction index
$R_w + C_{tr}$	As above, with a spectral adaptation term applied to account for the effects of low frequency noise, and based on urban traffic noise
R'_w	The 'apparent sound reduction index', a field measurement to obtain the sound reduction index of a material or element, with all effects of site installation accepted.

Standardised impact sound pressure level, $L'_{nT,w}$

$L'_{nT,w}$ is the single figure used to characterise the impact sound pressure level in a receiving room, normalised to a reference reverberation time. Impact noise can be classified as (but is not limited to) the result of footfall impact on a separating floor to a habitable space below. All values are described using the decibel.

Reverberation time, T and T_{mf}

The reverberation time of a space is a measure of the rate at which sound decays, measured in seconds. It is defined as the time taken for the sound pressure level to reduce by 60 dB from its original impulse level. Reverberation time is commonly quoted in terms of the mid-frequency reverberation time, T_{mf} , the arithmetic average of the reverberation times in the 500 Hz, 1 kHz and 2 kHz octave bands.

Absorption Coefficient

The acoustic absorption provided by a surface is defined as the sound absorption coefficient α , which denotes the fraction of sound energy absorbed between 0 (no absorption) and 1 (no reflection). The absorption coefficient of a material varies with the frequency of incident sound waves, therefore is considered for different frequencies.

Absorption Class

Based on the absorption coefficients, the overall sound absorption of a material is classified from Class A to Class E as defined in BS EN ISO 11654:1997, with Class A providing the highest level of acoustic absorption.

Noise rating, NR

The noise rating or NR system is commonly used in the design of noise emitted by internal building services systems. The system is frequency dependent, and was empirically derived to prevent disturbance to occupants in habitable or working areas from building services noise that exhibits 'tonal' elements, e.g. rumbles, whines, whistles etc. There is no direct relationship between the average 'A' weighted noise level in dB and the NR. However, as a guide, and assuming the absence of strong low frequency content in a given noise, the NR could generally be said to be 6 dB less than the average 'A' weighted dB value.

Privacy

Privacy is the addition of the level of sound insulation between two rooms and the background noise within a receiving room. It can be used to assess the level of privacy afforded in the 'receiving room' for speech from the 'source room'. The 'privacy factor' is a unit-less value that is the combination of the average 'A' weighted background noise level in dB and the weighted sound level difference (D_w) in dB.

Appendix V. SBE Acoustic Credentials

SBE have specialised in providing the UK Construction Industry with a range of acoustics services since 2006. Specialising in Building Acoustics, all SBE acousticians are members of the Institute of Acoustics.

SBE is accredited for on-site acoustic testing by United Kingdom Accreditation Service (UKAS) (Testing Laboratory Number 2731).

SBE meet the relevant acoustic requirements typically required in the UK, including for sound insulation testing as defined in Approved Document E for the purposes of testing for Part E to the Building Regulations 2010.

Appendix VI. Report Conditions

This document has been prepared for the sole use, benefit and information of the Client. The liability of Stroma Built Environment Ltd. in respect of the information contained herein will not extend to any third party unless prior agreement is obtained in writing from Stroma Built Environment Ltd.

This report is limited to addressing the specific acoustic issues contained herein. Advice has been provided for acoustic reasons only and it is recommended that appropriate expert advice be sought on all the ramifications, e.g. safety, fire, structural, CDM etc., associated with any proposals contained herein.

The in-situ performance of acoustic measures is influenced to a large extent by the quality of workmanship and compliance with the specifications on-site during construction, as such, Stroma Built Environment Ltd. accepts no liability for issues with acoustic performance arising from such factors.

Acoustic survey and testing work carried out for the project is representative of the prevailing conditions at the time of the work. Conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

In particular, it should be noted that where calculations are carried out that are based on assumptions regarding certain aspects where information has not been supplied, these are provided for indicative purposes only and should be treated as such.