Att. Mr. Matthew Bricknell,

THE HILL GROUP
London

Tel : 020 8527 1400 / 07889 807574
Email: matthewbricknell@hill.co.uk

Date : 01 Sep 2022
Ref : 32.061.02.R2

Please find below revised (R2) SPECTRA acoustical design, material supply and site installation report for Air Source Heat Pump Units of **Agar Grove I-J-K-L BLOCKS** regarding Pre Order Meeting Minutes dated 22 AUG 2022 in accordance with **JAJ02176-TN-01-R0 (Document name is JAJ02176-TN-02-R0_29102021)** and **PBA Acoustic Review Report** dated **08 October 2019.**

Spectra Revision-1: (11 Jul 2022)

1.1 Type-1 =Two enclosures with outlet attenuators

1.2 Type-2 =Three enclosures without top attenuators,

Spectra Revision-2: (30 Aug 2022)

Type-1 (Two enclosures with outlet attenuators)

R2.T1.1 Angular Outlet Attenuators with increased splitter quantity and splitter height (Total enclosure height is 3000mm as previous)

R2.T1.2 Increased intake louvre surface area

Type-2 (Three enclosures without outlet attenuators)

R2.T2.1 Increased enclosure height (from 2200mm to 2800mm)

R2.T2.2 Increased intake louvre surface area

R2.T2.3 Revised J-K-L Blocks coordinates

A. SCOPE OF WORK

Our proposal includes the acoustical design, material supply and site installation of ASHP *Outdoor Unit Noise Enclosures at* Agar Grove Project in any **RAL Colour**.

MXF ASHP Selection and Noise Level Data:

MXF-LBC/Arcadis calculations based on Daikin estimation methodology, **and proposed selection**, based on 37-55 deg C cylinder recovery , and 1 kW

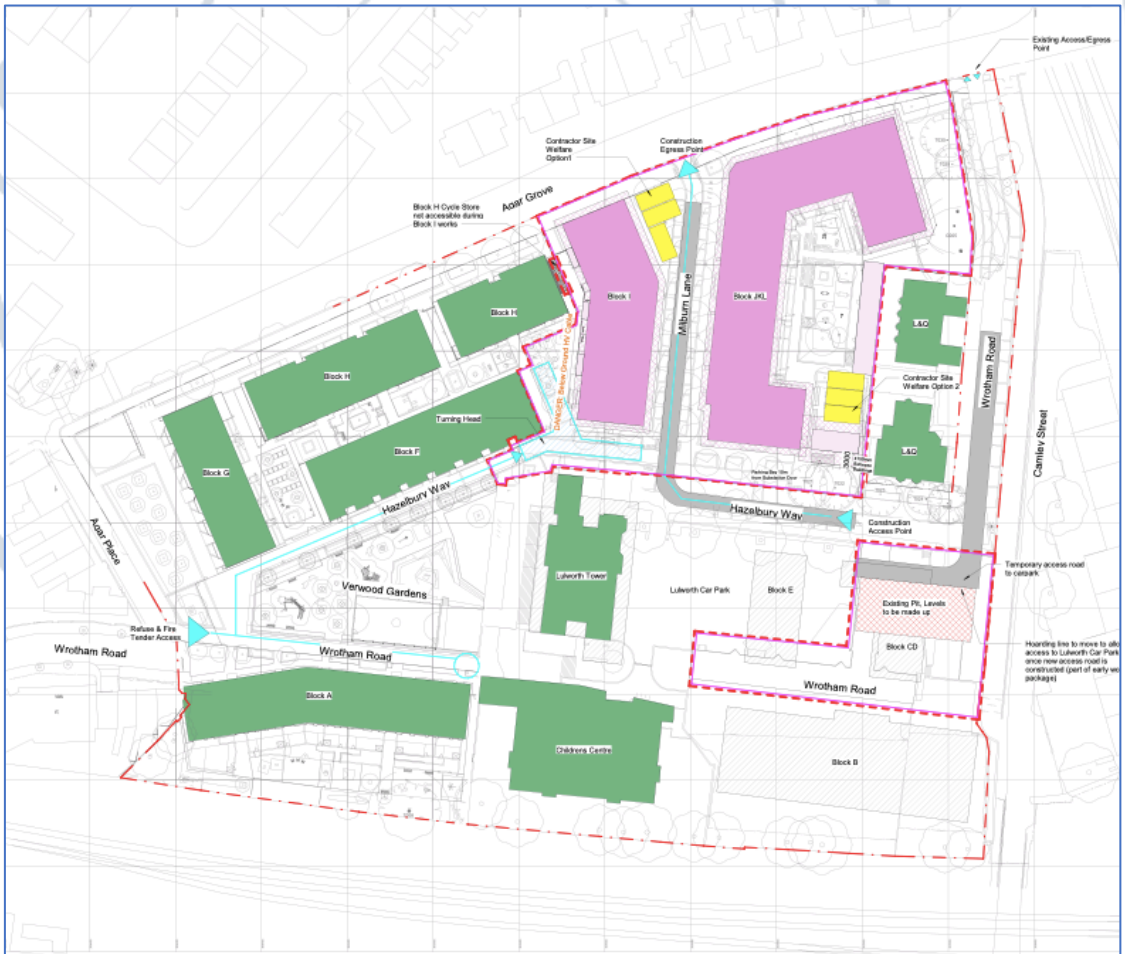
Block	Units	Daikin curve Htg	DHW	Av Htg/unit kW 1.00	Loop Htg kW 0.10	Loop DHW kW 4.40 1.30	Loop MAX kW	Margin ASHP 10	2.00					Check kW/unit
I north	16	0.629	0.371	1.00	8.46	18.40	26.87	29.55	14.78	EWYT0	32	CZNBA 1	2 No.	1.85
I south	24	0.666	0.334	1.00	13.58	24.85	38.43	42.28	21.14	EWYT0	32	CZNBA 1	2 No.	1.76
JKL north	27	0.675	0.325	1.00	15.53	27.20	42.73	47.00	23.50	EWYT0	40	CZNBA 1	2 No.	1.74
JKL central	29	0.680	0.320	1.00	16.82	28.77	45.59	50.15	25.07	EWYT0	40	CZNBA 1	2 No.	1.73
JKL south	28	0.678	0.322	1.00	16.18	27.95	44.13	48.55	24.27	EWYT0	40	CZNBA 1	2 No.	1.73

Heat pump EWYT-CZ series

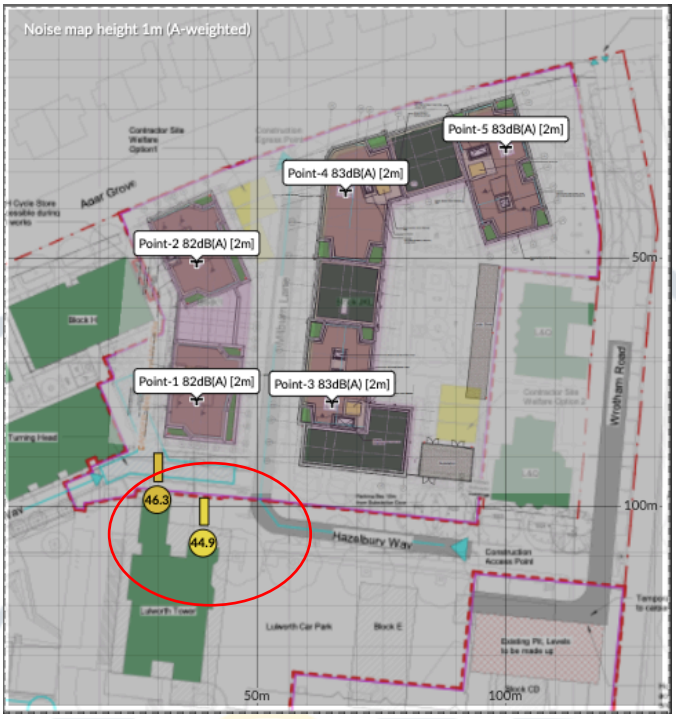
Heating & cooling			EWYT-CZN/CZP/CZH	016	021	025	032	040 - MONO	040 - DUAL	050	064	090
Sound power level	Cooling	Nom.	dBA	76		78	79	80		81	83	85

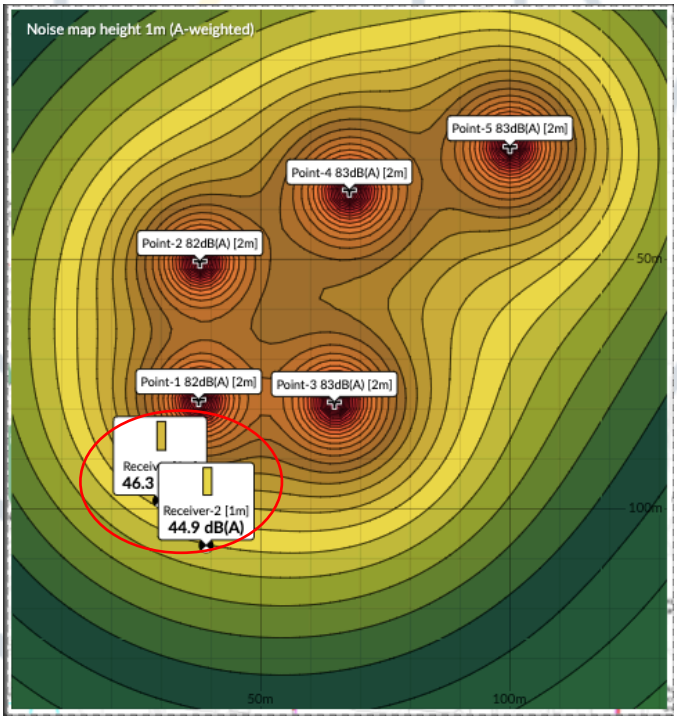
1. New Coordinates for the AGAR Blocks I, J, K & L

New Coordinates for the AGAR Blocks I, J, K & L prior to the Spectra Revision-2 design.



2. NOISE MAP WITHOUT ANY ENCLOSURES

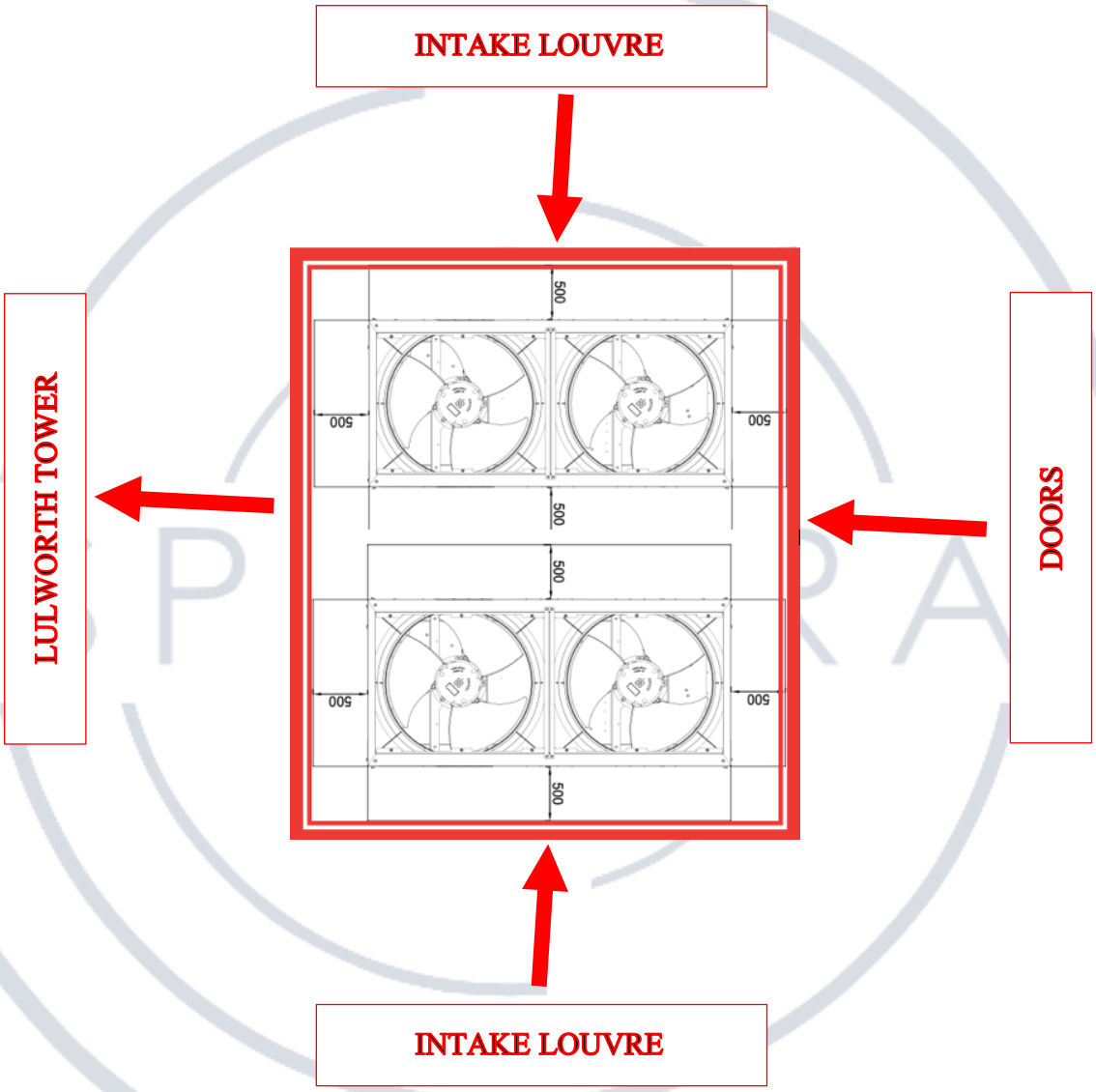




Critical Noise Levels are higher than requested at the Lulworth Tower façade without using any enclosures.
(Reciever-1=46.3 dB(A), Reciever-2=44.9 dB(A)

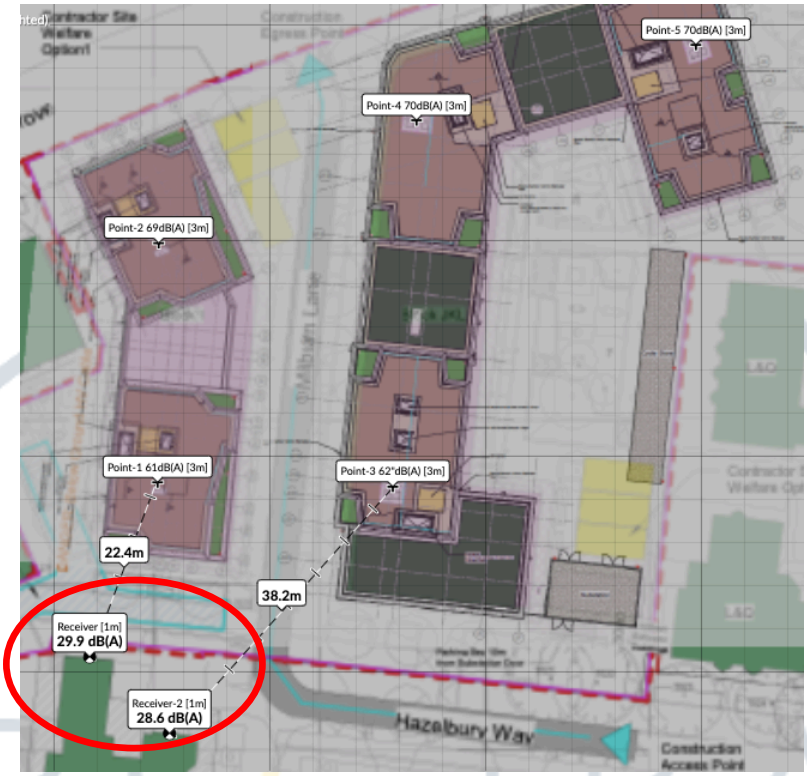
3. ROTATED OUTDOOR UNITS AND ENCLOSURE PLAN VIEW

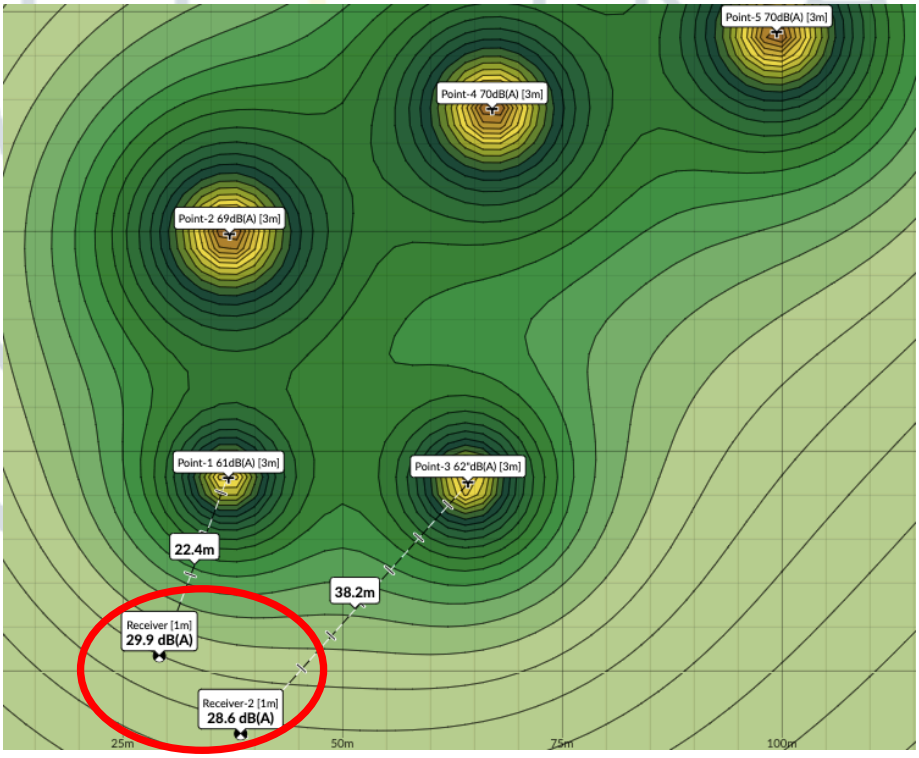
ASHP Outdoor units shall be rotated 90°. Intake louvers shall not be facing Lulworth Tower.



Doors will be opened at the opposite side by this means during the maintenance minimised noise will be transferred.

4. NOISE MAP WITH REVISION-2 SPECTRA ACOUSTIC ENCLOSURE (SAE)

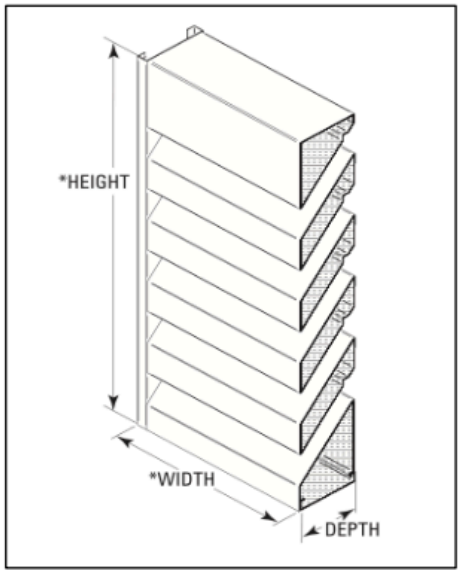


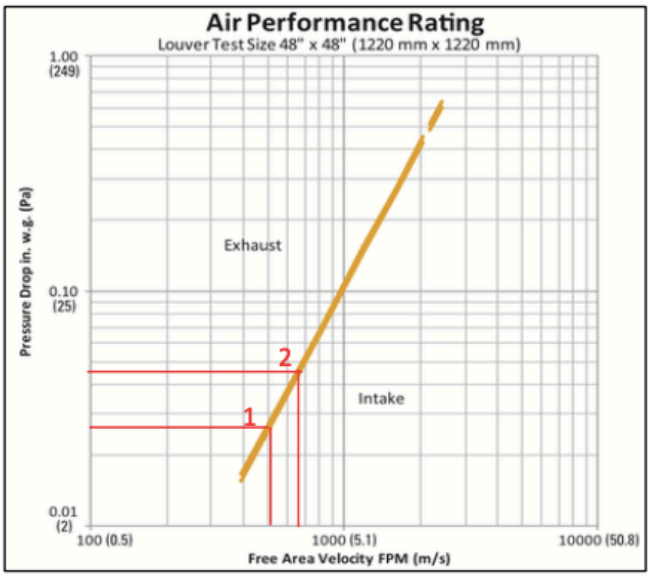


Revision-2 31.08.2022

			DAIKIN			LULWORTH TOWER W/O MITIGATION		LULWORTH TOWER WITH MITIGATION		
	SOURCE	BLOCK	ASHP	SPL - LWA	SPL - LWA	RECEIVER-1	RECEIVER-2	RECEIVER-1	RECEIVER-2	SPECTRA ENCLOSURE
			Model	dBA	dBA	dBA	dBA	dBA	dBA	MODEL
POINT-1	S1	I	EWYT0 32	79	82	46.3	44.9	29.9	28.6	TYPE-1 SAE WITH OUTLET ATTENUATOR
	S1	I	EWYT0 32	79						
POINT-2	S2	I	EWYT0 32	79	82					TYPE-2 SAE W/O OUTLET ATTENUATOR
	S2	I	EWYT0 32	79						
POINT-3	S3	JKL	EWYT0 40	80	83					TYPE-1 SAE WITH OUTLET ATTENUATOR
	S3	JKL	EWYT0 40	80						
POINT-4	S4	JKL	EWYT0 40	80	83					TYPE-2 SAE W/O OUTLET ATTENUATOR
	S4	JKL	EWYT0 40	80						
POINT-5	S5	JKL	EWYT0 40	80	83					TYPE-2 SAE W/O OUTLET ATTENUATOR
	S5	JKL	EWYT0 40	80						

5. Intake Louvres (Spectra Acoustic Louvres [SAL] will be at only two sides of the enclosure.



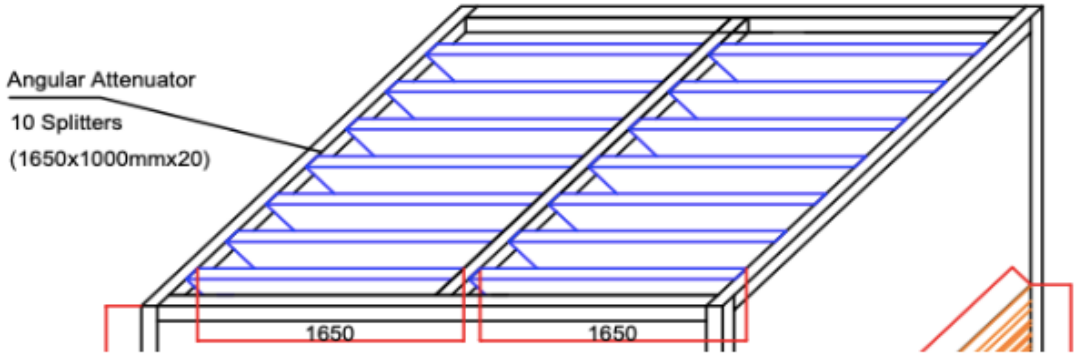


		Air Flow Rate	Louvre Dimensions				Air Velocity	Air Pressure Drop
	ASHP MODEL	l/s	Height	Width	Depth	Free Area Ratio	(m/s)	(Pa)
1	EWYT0 32 CZNBA	5080	1400	2600	110	51%	2.56	9.72
2	EWYT0 40 CZNBA	6710	1400	2600	110	51%	3.38	15.95

Acoustic Performance Ratings	Measured at Octave Band Center Frequencies					
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Free-Field Noise Reduction (dB)	11	12	17	28	32	23
Transmission Loss (dB)	5	6	11	22	26	17

6. Outlet Section: There will be 2 different types of outlet sections:
-SAE-Type-1 will have acoustically isolated outlet noise attenuators regarding airflow and the requested pressure drop of the ASHP.

- SAE-Type-2 will not have any outlet attenuators, and it is a free-flow type, open-top model.



		Splitter (mm)				
Outlet Attenuator	**Silencer Type**	**Angle**	**Width**	**Distance**	**Height**	**Quantity**
SAE-TYPE-1	Straight	30-45	100	100	1000	10

Attenuator Noise Mitigation Data:

	ASHP MODEL	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB	dB(A)
1	EWYT0 32 CZNBA	75	82	80	79	73	64	59	53	85.9	79
1	EWYT0 32 CZNBA	75	82	80	79	73	64	59	53	85.9	79
S1, S2	**2xEWYT0 32 CZNBA**	**78**	**85**	**83**	**82**	**76**	**67**	**62**	**56**	**88.9**	**82**
	Lwi	75	82	80	79	73	64	59	53	85.9	79
	△LI	1	2	3	6	16	20	5	1		
	△LENT	2	2	3	4	2	1.5	1.5	1.5		
	IL	3	6.5	12	17	33	29	19	13		
	Lwo	69	71.5	62	52	22	13.5	33.5	37.5	74	58
S1, S2	**2xEWYT0 32 CZNBA**	**72**	**74.5**	**65**	**55**	**25**	**16.5**	**36.5**	**40.5**	**77**	**61**

2	EWYT0 40 CZNBA	76	83	81	80	74	65	60	54	86.9	80
2	EWYT0 40 CZNBA	76	83	81	80	74	65	60	54	86.9	80
S3, S4, S5	**2xEWYT0 40 CZNBA**	**79**	**86**	**84**	**83**	**77**	**68**	**63**	**57**	**89.9**	**83**
	Lwi	76	83	81	80	74	65	60	54	86.9	80
	△LI	1	2	3	6	16	20	5	1		
	△LENT	2	2	3	4	2	1.5	1.5	1.5		
	IL	3	6.5	12	17	33	29	19	13		
	Lwo	70	72.5	63	53	23	14.5	34.5	38.5	74	58
S3, S4, S5	**2xEWYT0 40 CZNBA**	**73**	**75.5**	**66**	**56**	**26**	**17.5**	**37.5**	**41.5**	**78**	**62**

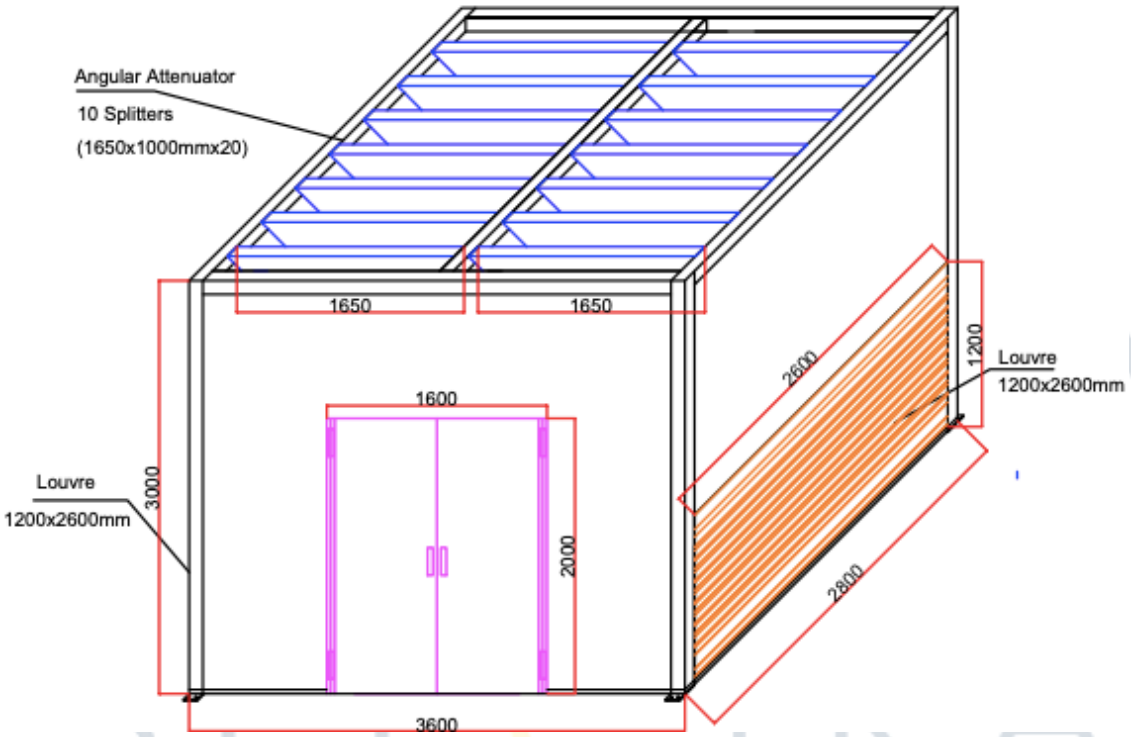
Attenuator Pressure Drop:

		Air Flow Rate	Attenuator Dimensions				Air Velocity	Air Pressure Drop
	ASHP MODEL	l/s	Length	Width	Spacing	Free Area Ratio	(m/s)	(Pa)
1	EWYT0 32 CZNBA	5080	2200	1650	100	50%	2.83	**11.45**
2	EWYT0 40 CZNBA	6710	2200	1650	100	50%	3.73	**18.72**

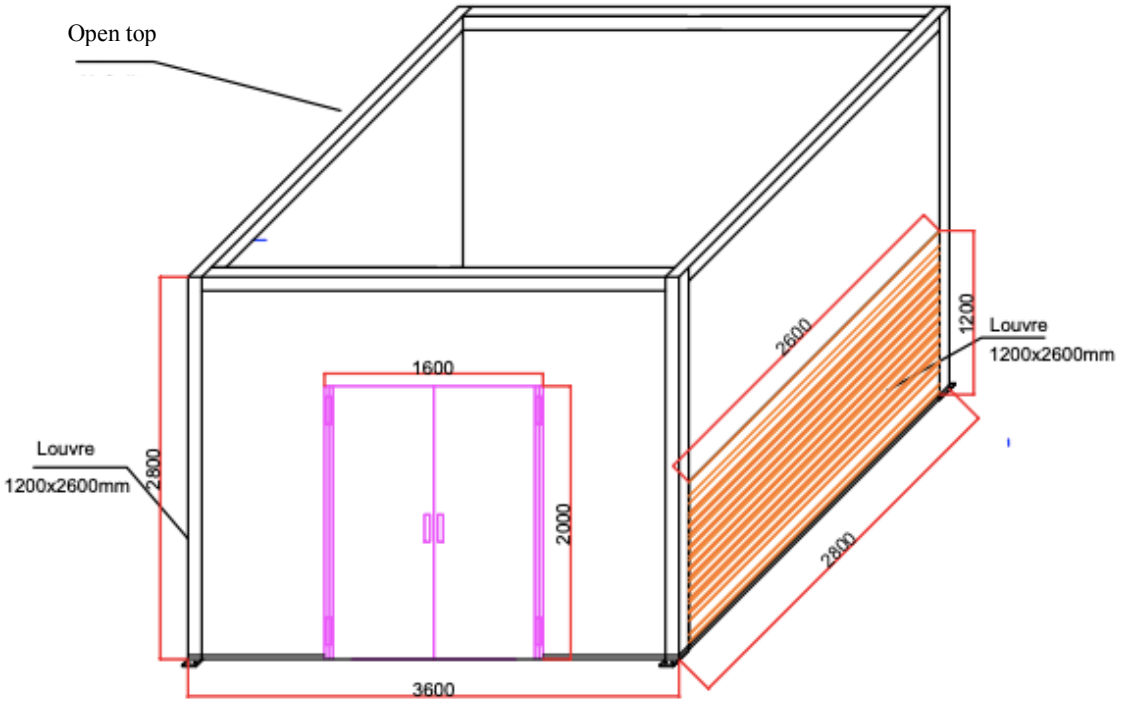
Total Pressure Drop (INLET +OUTLET) per ASHP:

1. EWYT0 32 CZNBA / ΔP_{TOTAL} = 9.72 Pa + 11.45 Pa = **21.17 Pa**
2. EWYT0 40 CZNBA / ΔP_{TOTAL}= 15.95 Pa + 18.72 Pa = **34.67 Pa**

7. SPECTRA ACOUSTIC ENCLOSURE COMPLY WITH THE PBA REPORT TYPE-1 WITH OUTLET ATTENUATORS (2EA) (POINTS – 1 & 3)

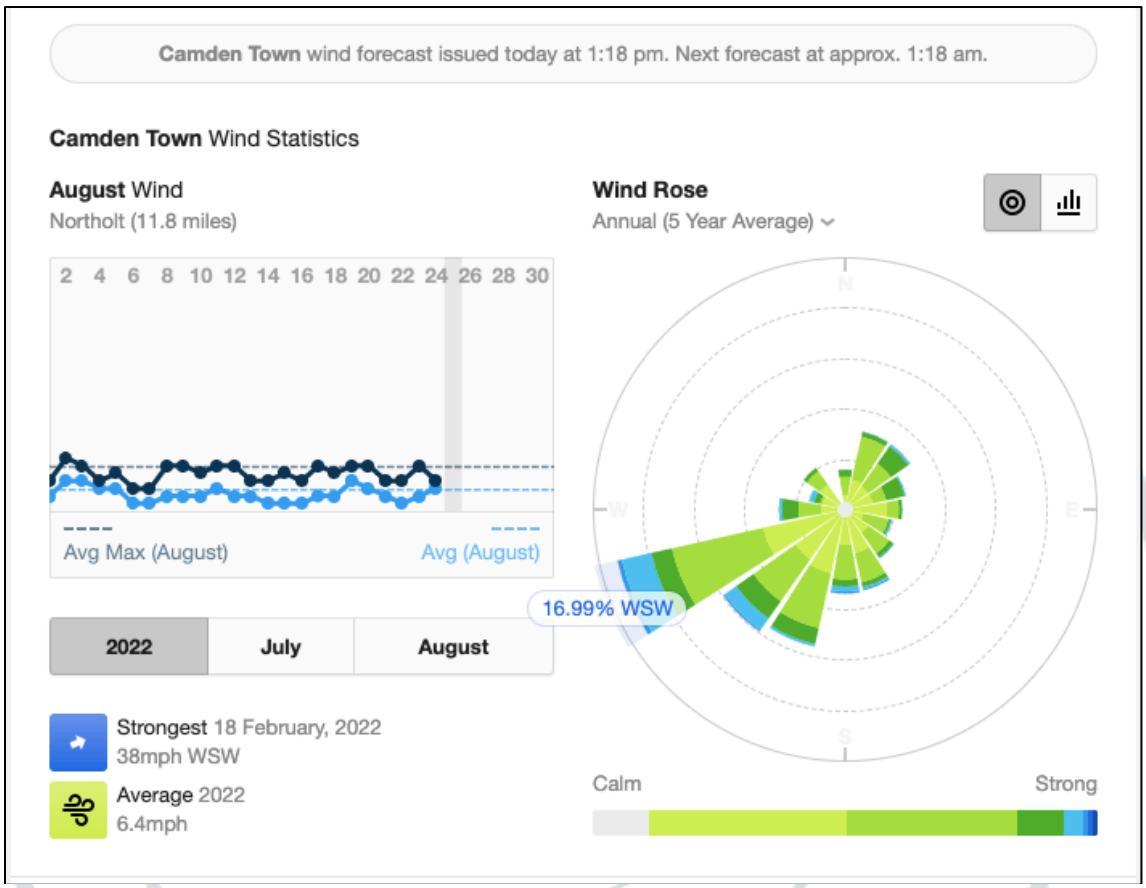


TYPE-2 NO OUTLET ATTENUATORS (3EA) (POINTS – 2 & 4 & 5)

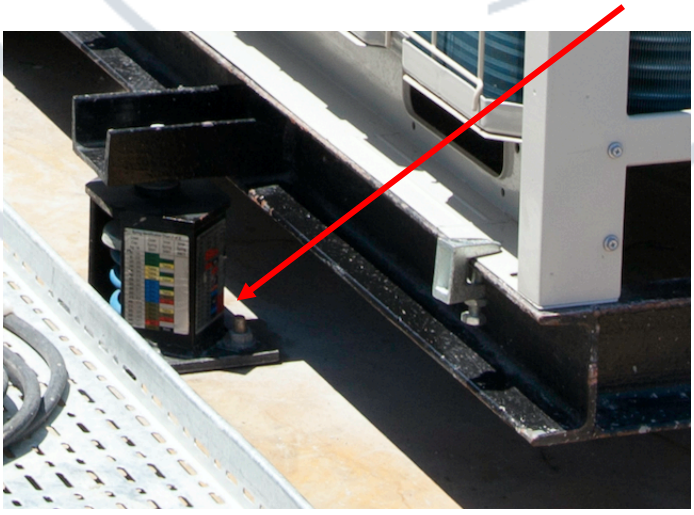


8. Wind Effect

Prevailing wind direction in Camden is West to South West.



9. For "Solid Noise Transmission" (**Vibration**), ASHP needs to be isolated through to the top floor occupant by **2" deflected** spring isolators.

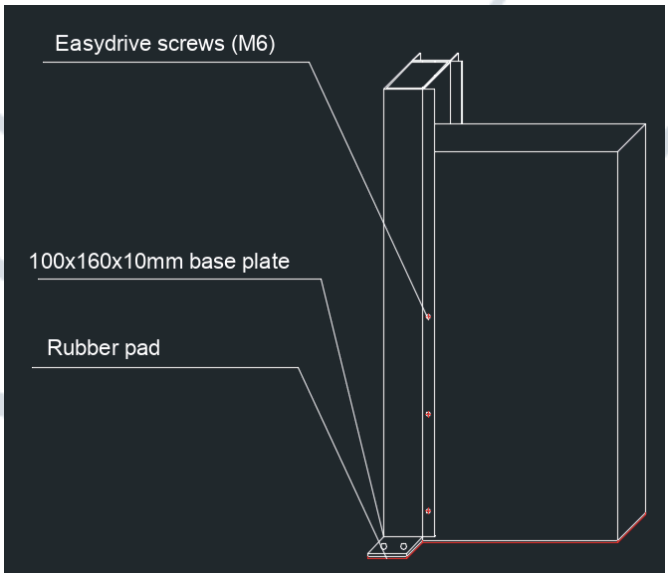


10.SAE (Spectra Acoustic Enclosure) Acoustic Mitigation:

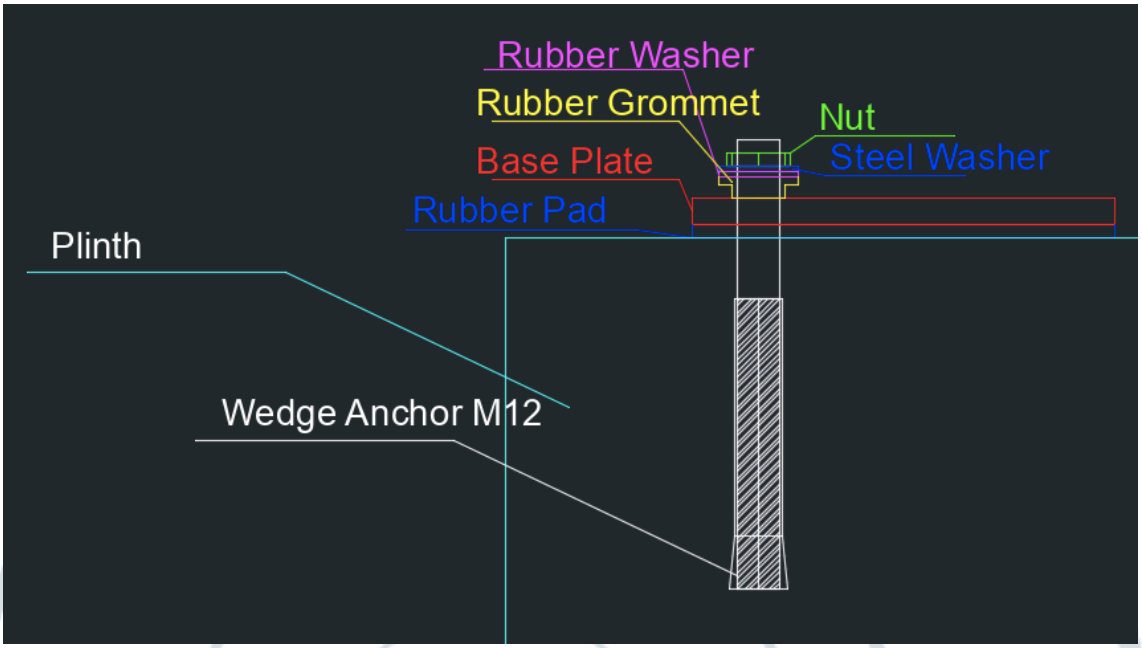
		Linear Octave Frequency Bands							
	Sound reduction Rw [dB]	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
REQUESTED	20	6	14	16	18	20	19	13	3
SPECTRA	21	8	12	18	23	23	20	14	8

11.Sample view of an ASHP Noise Enclosure (Any RAL Colour)

12.Enclosure Corner Installation Detail



13.Enclosure Base Plate Anchor Detail



14.Enclosure Base Plates

15.Enclosure Material Technical Details:

1- All the material sound-absorbing panels shall be fire-rated according to DIN 4102 A2 standards.

2- Sound-absorbing rockwool material shall be recycled according to EU 97/69/EEC regulations with the TRGS 905 standard.

3- Glass fibre coverings and rock wool material shall be produced by the ISO 9001 Quality Management and ISO 14001 Environmental Management certified by BVQI. Materials shall comply with BS **OHSAS** 18001 for the minimum requirements for best practices for occupational health and safety management.

4- Glass fibre coverings and rock wool material shall be marked by CE by the standards of EN 13162.

5- Acoustic panels facing to Airborne sound source shall be a minimum of %47 of perforated and 1.50 mm of thickness galvanised sheet metal

6- All panels will be numbered for easy installation by Vendor.

7- Sound-absorbing panels shall be minimum of 100 mm in thickness and filled with special acoustic insulation material of two different densities of 75 to 85 kg/m3.