Project Title	College Lane Camden				
Design Note Title	Feasibility for ASHP's				
By	L. Vieira	**Checked**	O. Payne	**Date**	31.01.2025

BOX TWENTY

1. Introduction

Four Quarters have employed Box Twenty to review the feasibility of servicing Block 3 at College Lane Camden with heat pumps to provide heating and hot water. We understand that the building structure has already been built, however, Block 3 has not been completed and the services are yet to be installed. Therefore, this presents an opportunity for the original servicing strategy proposals to be changed, and Four Quarters would like to review the viability of an air source heat pump (ASHP) system providing heating & hot water to the building.

This report highlights the findings from this feasibility study, design info and lists the key assumptions which were made during the assessment.

2. Key Assumptions and Design Info

As part of the heating and hot water load assessment the following design criteria has been used based on the latest architectural layouts.

				Bathroom			Ensuite			Kitchen
Flat Type	Level	Flat Number	Area (m^2)	Shower (Qty)	WHB (Qty)	Bath (Qty)	Shower (Qty)	WHB (Qty)	Bath (Qty)	Sink (Qty)
3-Bed	LG	Flat 1	121.27	0	1	1	1	1	0	1
2-Bed	LG	Flat 2	62.95	0	1	1	0	0	0	1
N/A	LG	Communal Corridor	18.16	NA	NA	NA	NA	NA	NA	NA
3-Bed	Ground	Flat 3	126.81	0	1	1	1	1	0	1
2-Bed	Ground	Flat 4	65.51	0	1	1	0	0	0	1
1-Bed	Ground	Flat XX	32.86	1	1	0	0	0	0	1
N/A	Ground	Communal Corridor	23.23	NA	NA	NA	NA	NA	NA	NA
3-Bed	1st	Flat 5	81.24	0	1	1	1	1	0	1
2-Bed	1st	Flat 6	64.19	0	1	1	0	0	0	1
1-Bed	1st	Flat XX	32.86	1	1	0	0	0	0	1
N/A	1st	Communal Corridor	23.23	NA	NA	NA	NA	NA	NA	NA
3-Bed	2nd	Flat 7	81.24	0	1	1	1	1	0	1
2-Bed	2nd	Flat 8	64.19	0	1	1	0	0	0	1
N/A	2nd	Communal Corridor	23.23	NA	NA	NA	NA	NA	NA	NA

Architectural Drawing References:

- Lower Ground Floor- Proposed; PA-300 – C2; Issue for Planning 20.12.24;
- Ground Floor-As Approved; EX-301 – C2; Issued for Planning 20.12.24;
- First Floor-Proposed; PA-302 – C2; Issued for Planning 20.12.24;
- Second Floor- Proposed; PA-303 – C2; Issued for Planning 20.12.24;
- Proposed Roof Plan; PA-304; Issued for Planning 20.12.24;

The following design criteria has been used in calculating the estimated peak demand load for sizing the ASHP's. Estimated heating load allowances:

- Heating Loss in Dwellings = 30W/m^2;
- Heating Loss in Corridor = 40W/m^2;

The following table stipulates the flow rates and draw temperatures used for sanitaryware & kitchen sink:

Flow Rates	Design	Minimum	Draw Temp	Range
	[l/m]	[l/m]	[°C]	[°C]
Bath	12.0	9.0	43.0	41-44
Shower	12.0	6.0	41.0	38-43
Sink	12.0	6.0	47.0	46-48
Wash Hand Basin (WHB)	9.0	6.0	40.0	38-41
References: NHBC Guide Technical Standards (2021), Beama: Recommended Code of Practice for Safe Water Temperatures (February 2020) & CIBSE Guide G (2014)				

For sizing the instantaneous domestic hot water loads the following assumptions have been made:

- 3 Bed Flat has been based on 1no. bath, 1no. shower and 1no. sink being used simultaneously.
- 2 Bed Flat has been based on 1no. bath and 1no. sink being used simultaneously.
- 1 Bed Flat has been based on 1no. sink being used.

For the low temperature hot water (LTHW) system the following flow and return temperatures have been used from the ASHP to the Heat Interface Units (HIU's) located in each flat:

- LTHW from ASHP to HIU (Flow) = 57°C;
- LTHW from HIU to ASHP (Return) = 30°C;

Water properties for heating plant:

Heating Plant Properties		
Storage Temperature for Thermal Store / Buffer Vessel	57	°C
Density	984.7	kg/m3
Specific Heat Capacity of Water (Cv)	4.185	kJ/kg.K
Return Water Temperatures to ASHP from HIU's for Instantaneous Domestic Hot Water	18.8	°C
Return Water Temperatures to ASHP from HIU's for Heating	35	°C

Design criteria for HIU's:

	DHW (Flow to outlets)	**MCW (Flow to HIU)**
Temperature [°C]	50	10
Density [kg/m3]	984.7	kg/m3
Specific Heat Capacity of Water (Cv) [kJ/kg.K]	4.185	kJ/kg.K
Pressure [Bar]	-	1.00

For sizing the heating load the following diversity factor has been used as per CIBSE CP1 guidance:

$$Space\ Heating\ Diversity\ Factor = 0.62 + \frac{0.38}{N}$$

Where:
N = Number of dwellings
For sizing the instantaneous domestic hot water load the follow calculation has been used (from DS 439):

$$q_d = 2q_m + \theta(\Sigma q_f - 2q_m) + A\sqrt{q_m\theta}\sqrt{\Sigma q_f - 2q_m}$$

Where:
$q_d = \ design\ water\ flow\ for\ distribution\ pipes\ to\ randomly\ used\ outlets$
$q_m = \ weighted\ mean\ water\ flow\ to\ several\ outlets\ connected\ to\ distribution$
$\Sigma q_f = \ sum\ of\ assumed\ water\ flows\ for\ all\ randomly\ used\ outlets, Q_f$
$A\ \&\ \theta = \ constants\ depending\ on\ desired\ safety\ against\ overloads$

Results for peak plant sizing as per design calculations:

Peak Plant Sizing		
Dwelling HTG Diversity Factor	0.6580	10 HTG HIUs
Dwelling HTG - 0.658 Diversity	14.5	[kW]
Communal Area Diversity Factor	0.8	Direct to LTHW
Communal HTG - 0.8 Diversity	2.8	[kW]
Total HTG Load	17.3	[kW]
Σq_f	2.396	[l/s]
Diversified DHW Flow Rate, q_d	0.411	[l/s]
Effective DHW Diversity Factor	0.1715	10 DHW HIUs
Diversified Heating Plant DHW Flow Rate	0.427	[kg/s]
Diversified DHW Load	68.2	[kW]
Peak Plant Load (No Thermal Storage)	86	[kW]

Heating Plant Flow Rates		
Dwelling Heating Flow Rate	0.158	[kg/s]
Communal Heating Flow Rate	0.030	[kg/s]
Dwelling DHW Flow Rate	0.427	[kg/s]
Total Flow Rate	0.615	[kg/s]

As can be seen our preliminary calculations indicate a peak building heating and hot water load of 86kW without a thermal store. Using a thermal store of 2000L (minimum) would allow for peak plant shaving of the load required from the ASHP/(s). Therefore, the result of this allows us to reduce the size of the proposed plant and also ensures we meet the minimum system water content required to prevent the ASHP's from excessively cycling on and off.

Our results indicate the following estimated ASHP size and thermal storage:

- Peak Plant = 45kW (minimum)
- Thermal storage = 2000L (minimum)
- Peak Shaving = 47%

It is proposed that the ASHP's are located on the roof of the building. Based on the above assessment, Box Twenty have carried out a space planning exercise to estimate the plant space requirements for the ASHP's and associated primary equipment.

Due to the noise generated by the ASHP's it has been assumed that a plant enclosure is provided with acoustic louvres & acoustic screening to mitigate any potential noise issues from the air source heat pump units.

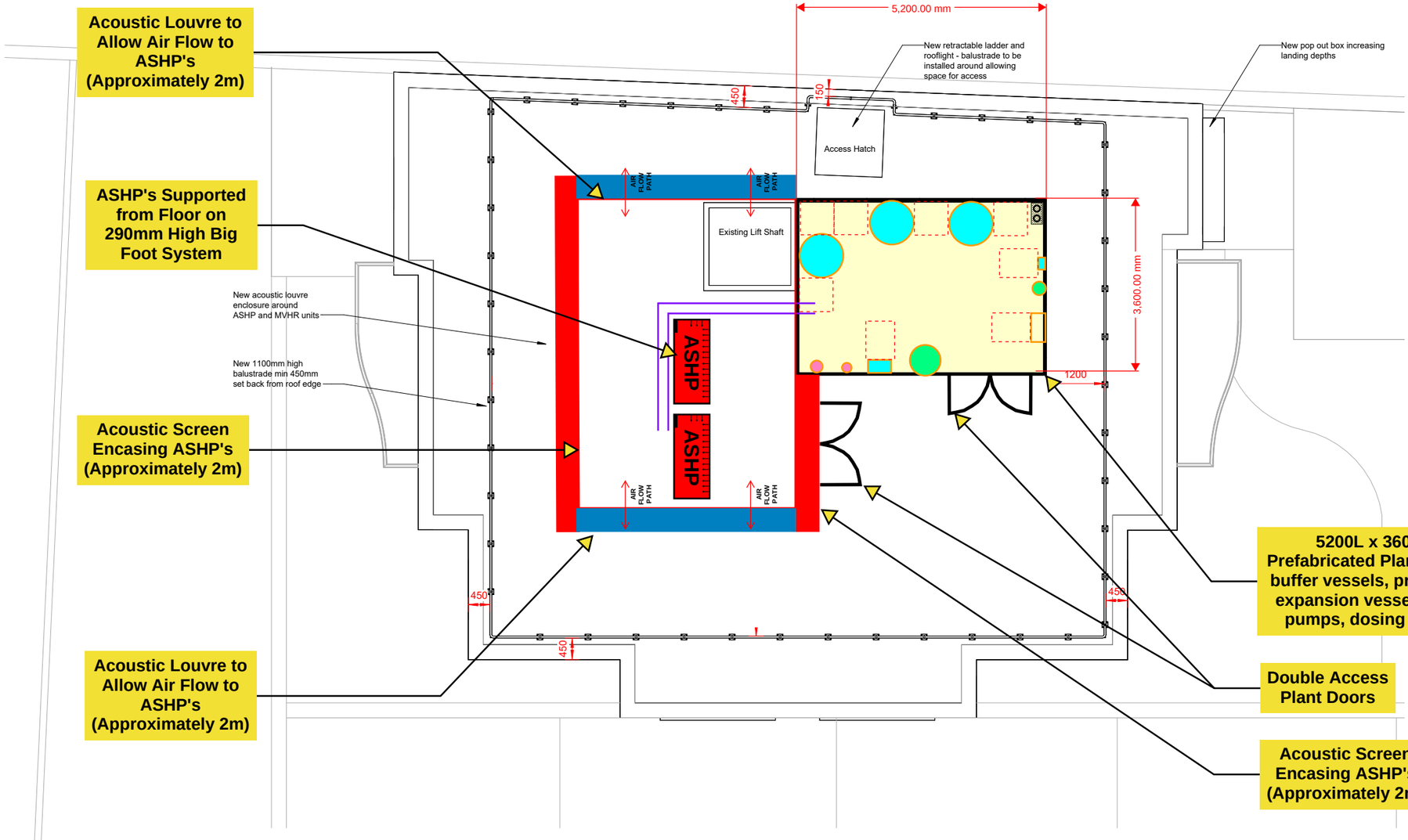
For our sketch indicating the ASHP's spacing requirements and heating plant room size, please refer to separate markup appended to this feasibility report.

Refer to Appendix A.

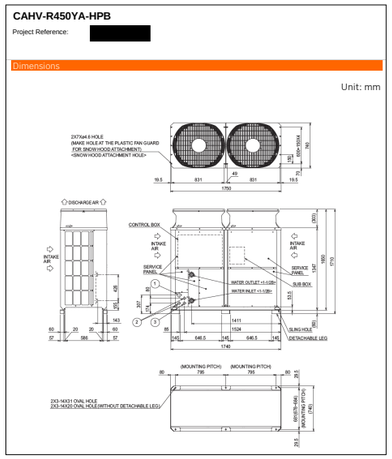
Appendix A

ASHP’s Spacing Requirements and Heating Plant Room Size

BOX TWENTY



Typical ASHP



ASHP Dim's

1 Proposed Roof Plan

1 : 100

Typical Prefab Heating Plant

Typical Big Foot Multi Frame

Notes.
1 - Preliminary plant arrangement and dimensions are indicative only and subject to detailed design assessment
2 - Acoustic louvres in enclosure screen assumed to be 600mm deep. Subject to detailed acoustic assessment

BOX TWENTY

Project Name	College Lane Camden	Drawing Title	ASHP's & Heating Plant Room	Drawn By	L. Vieira	Purpose of Issue	Draft
Project Number	P2815	Checked by	O. Payne	Date	31.01.2025	Revision	P01