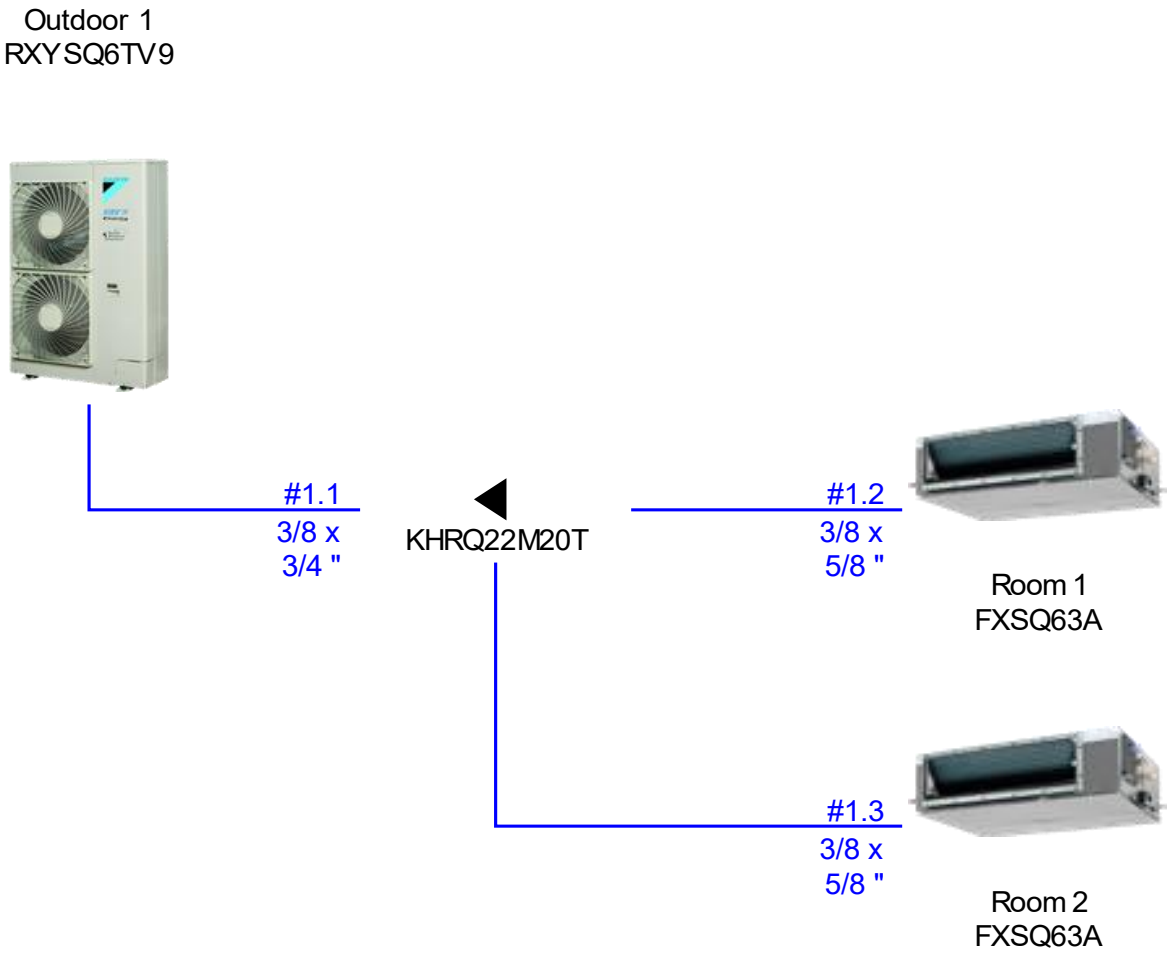
Our Ref: EQN137961
Date: 7th November 2023

Project at Watchhouse Hampstead-Cooling and heating Hierarchy Strategy

General

The air conditioning equipment proposed to be installed is a Daikin heat pump VRV (Variable Refrigerant Volume) system that are by design a refrigeration cycle that moves heat from the building in summer and introduces heat from the external ambient air in the winter.

Piping Outdoor 1



We considered within our equipment selection the following items.

1) Cost savings for a single system that can provide direct cooling and heating.
2) Space saving from central plant equipment.
3) Single source energy all electric.
4) Cooling loads inclusive of Solar Gains, expected occupancy, building fabric and thermal transmission and infiltration gains, also incidental utensil heat loads.(Attached)
5) Heating loads, inclusive of heat loses from the building fabric at low ambient temperatures. (Attached)
6) Seasonal Efficiency in Summer (Below)
7) Seasonal Efficiency in Winter (Below)
8) Running costs.
9) Equipment sustainable life cycle.
10) Consideration to the Environment and carbon emissions.
11) Services space requirement

Equipment Selection

Model	Quantity	Description
RXYSQ6TV9	1	RXYSQ-TV9 (VRV IV Mini Standard 1 phase)
FXSQ63A	2	FXSQ-A - Concealed ceiling unit with medium ESP
KHRQ22M20T	1	Refnet branch piping kit
BRC1H52W	1	Remote controller (white)

Seasonal Efficiency

Name	Model	$\eta_{s,h}$ heating	$\eta_{s,c}$ cooling	SCOP	SEER	CSPF
		%	%			
Outdoor 1	RXYSQ6TV9	192.8	278.0	4.90	7.00	-

Hazards and Risks

The VRV Air Conditioning equipment has been selected to operate with refrigerant HFC410A, with a global warming potential of 2088.

This HFC refrigerant has no chlorine molecules and therefore is ozone friendly and complies with the current Montreal Protocol legislation on ozone depletion.

Refrigerant information

Name	Model	Refrigerant type	GWP	Base charge kg	Extra charge kg	Total refrigerant charge kg	Total CO2 equivalent kg
Outdoor 1	RXYSQ6TV9	R410A	2087.5	3.60	unknown	unknown	7.52

Specific

The system provides cooling and heating to a combination of two Ceiling Concealed ducted units serving coffee house customer area.

The system comprises of one modular External Air-Cooled condensing unit positioned at the rear of the property within an acoustic shelter and will be set to operate at a reduced operating noise level to comply with local noise requirements.

All units are controlled by One Wired Remote Controller mounted on the ground floor area, whilst the overall enabling will be via a last person out switch.

The remote controller gives the following localised functions.
Manual On/Off
Timeclock function
Mode Selection (Cooling/Heating /Fan Only)
Fan Speed
Temperature range limit
Set temperature on auto reset.
Presence & Floor sensor setting.
Set back function.
Identify Fault Code

Heat Gains & Heat Losses attached.

COOLAIR EQUIPMENT LTD

John J Otterson-ACIBSE

Air Conditioning Load Computation

Date: Tuesday, 7th November 2023 **File:** Heat Gains.awc

Site location: United Kingdom, UK Standard Conditions.
Latitude: 52° 45' N **Longitude:** 1° 45' W **Altitude:** 25 metres above sea level.

Calculation for: 21st day of June. 12:00pm

Reference: Watchouse Hampstead

Ambient: DB 32.0°C; WB 23.0°C; RH 47% **Internal Floor Area:** 67.50m²
Room: DB 23.0°C; WB 16.0°C; RH 49% **Room Volume:** 209.25m³

Dimensions:

Wall	Length	Height	Thickness	Facing	Shading	Ground	Colour *f*	Grnd. *f*	Solar exp.
1	13.500	3.100	0.248m	S	100%	0%	0.53	0.23	No
2	5.000	3.100	0.124m	W	100%	0%	0.53	0.23	No
3	13.500	3.100	0.248m	N	0%	0%	0.66	0.23	Yes
4	5.000	3.100	0.248m	E	0%	0%	0.53	0.23	Yes

Construction:

Wall	Material	'U'	TD K	Gain
1	Brick facings 105mm, Air Cavity 25mm, Brick common 105mm, Plaster dense 13mm.	0.867	0	0.000
2	Internal partition wall	1.172	0	0.000
3	Brick facings 105mm, Air Cavity 25mm, Brick common 105mm, Plaster dense 13mm.	0.867	9	0.162
4	Brick facings 105mm, Air Cavity 25mm, Brick common 105mm, Plaster dense 13mm.	0.867	9	0.058

Total Wall Gain (not including windows or doors): 0.220 kW

Windows (Walls):

Wall	Type	Qty	Rebate	Shading	Blind *f*	Area	Gain
3	Double 6mm glaze + 12mm air gap	1	None	0%	None	2.57	0.095
3	Double 6mm glaze + 12mm air gap	1	None	0%	None	3.00	0.111
3	Double 6mm glaze + 12mm air gap	2	None	0%	None	4.93	0.366
3	Double 6mm glaze + 12mm air gap	1	None	0%	None	5.61	0.208
4	Double 6mm glaze + 12mm air gap	1	None	0%	None	4.50	0.688
4	Double 6mm glaze + 12mm air gap	2	None	0%	None	0.95	0.289

Total Window Gain: 1.758 kW

Air Conditioning Load Computation

Date: Tuesday, 7th November 2023 **File:** Heat Gains.awc

Doors:

Door	Wall	Type	Area	Colour *f*	Gain
1	2	Hardwood 25mm	1.68	0.05	0.000
2	4	Hardwood 25mm	1.68	0.05	0.035
				Total Door Gain: 0.035 kW	

Floor:

Description	'U'	TD K	Location	Gain
Timber, Joist 150mm, Rockwool 150mm, plasterboard	0.206	9.0	Intermediate	0.125
			Total Floor Gain: 0.125 kW	

Ceiling:

Description	'U'	TD K	Temp. Above	Gain
Felt, board, joist, Rockwool 100mm, plasterboard	0.223	0.0	23.0	0.000
			Total Ceiling Gain: 0.000 kW	

Infiltration:

Air change/day;
5.207

Sensible Gain: 0.137 kW **Latent Gain: 0.212 kW** **Total Gain: 0.350 kW**

Ventilation:

Air change/day;	Litres per second;	Cubic metres per min;	Cubic metres per hour.
81.841	198.209	11.893	713.6

Sensible Gain: 2.154 kW **Latent Gain: 3.339 kW** **Total Gain: 5.493 kW**

Personnel:

No.	Activity	People	Sensible	Latent	Total
1	Seated, very light work	28	1.960	1.260	3.220

Sensible Gain: 1.960 kW **Latent Gain: 1.260 kW** **Total Gain: 3.220 kW**

Lighting:

No.	Description	Qty	Rated Watts	Total
1	LED or Tungsten	-	15 watts per m²	1.012
			Total Gain: 1.012 kW	

Other loads:

No.	Description	Qty	Pwr.	Sensible	Latent	Total
1	Coffee Brewer (12cup/2 burners)	1	100%	1.100	0.560	1.660
2	Coffee brewing urn (large), per litre	1	100%	0.440	0.220	0.660

Sensible Gain: 1.540 kW **Latent Gain: 0.780 kW** **Total Gain: 2.320 kW**

Air Conditioning Load Computation

Date: Tuesday, 7th November 2023 **File:** Heat Gains.awc

Total Air Conditioning Load:

Sensible Heat Ratio	Sensible	Latent	Total
0.615	8.943 kW	5.591 kW	14.534 kW

Air Conditioning Load Computation

Date: Tuesday, 7th November 2023 **File:** Heat Gains.awc

Site location: United Kingdom, UK Standard Conditions.
Latitude: 52° 45' N **Longitude:** 1° 45' W **Altitude:** 25 metres above sea level.

Calculation for: Winter. (no solar considerations)

Reference: Watchouse Hampstead Heat Losses

Ambient: DB -5.0°C; WB -8.0°C; RH 29% **Internal Floor Area:** 67.50m²
Room: DB 23.0°C; WB 16.0°C; RH 49% **Room Volume:** 209.25m³

Dimensions:

Wall	Length	Height	Thickness	Facing	Shading	Ground	Colour *f*	Grnd. *f*	Solar exp.
1	13.500	3.100	0.248m	S	100%	0%	0.53	0.23	No
2	5.000	3.100	0.124m	W	100%	0%	0.53	0.23	No
3	13.500	3.100	0.248m	N	0%	0%	0.66	0.23	Yes
4	5.000	3.100	0.248m	E	0%	0%	0.53	0.23	Yes

Construction:

Wall	Material	'U'	TD K	Gain
1	Brick facings 105mm, Air Cavity 25mm, Brick common 105mm, Plaster dense 13mm.	0.867	0	0.000
2	Internal partition wall	1.172	0	0.000
3	Brick facings 105mm, Air Cavity 25mm, Brick common 105mm, Plaster dense 13mm.	0.867	-28	-0.505
4	Brick facings 105mm, Air Cavity 25mm, Brick common 105mm, Plaster dense 13mm.	0.867	-28	-0.180

Total Wall Gain (not including windows or doors): -0.686 kW

Windows (Walls):

Wall	Type	Qty	Rebate	Shading	Blind *f*	Area	Gain
3	Double 6mm glaze + 12mm air gap	1	None	0%	None	2.57	-0.296
3	Double 6mm glaze + 12mm air gap	1	None	0%	None	3.00	-0.346
3	Double 6mm glaze + 12mm air gap	2	None	0%	None	4.93	-1.139
3	Double 6mm glaze + 12mm air gap	1	None	0%	None	5.61	-0.648
4	Double 6mm glaze + 12mm air gap	1	None	0%	None	4.50	-0.520
4	Double 6mm glaze + 12mm air gap	2	None	0%	None	0.95	-0.218

Total Window Gain: -3.168 kW

Air Conditioning Load Computation

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Doors:

Door	Wall	Type	Area	Colour *f*	Gain
1	2	Hardwood 25mm	1.68	0.05	0.000
2	4	Hardwood 25mm	1.68	0.05	-0.109

Total Door Gain: -0.109 kW

Floor:

Description	'U'	TD K	Location	Gain
Timber, Joist 150mm, Rockwool 150mm, plasterboard	0.206	-28.0	Intermediate	-0.390

Total Floor Gain: -0.390 kW

Ceiling:

Description	'U'	TD K	Temp. Above	Gain
Felt, board, joist, Rockwool 100mm, plasterboard	0.223	0.0	23.0	0.000

Total Ceiling Gain: 0.000 kW

Infiltration:

Air change/day;
5.207

Sensible Gain: -0.426 kW **Latent Gain: -0.301 kW** **Total Gain: -0.727 kW**

Ventilation:

Air change/day;	Litres per second;	Cubic metres per min;	Cubic metres per hour.
81.841	198.209	11.893	713.6

Sensible Gain: -6.701 kW **Latent Gain: -4.724 kW** **Total Gain: -11.425 kW**

Personnel:

No.	Activity	People	Sensible	Latent	Total
1	Seated, very light work	28	1.960	1.260	3.220

Sensible Gain: 1.960 kW **Latent Gain: 1.260 kW** **Total Gain: 3.220 kW**

Lighting:

No.	Description	Qty	Rated Watts	Total
1	LED or Tungsten	-	15 watts per m²	1.012

Total Gain: 1.012 kW

Other loads:

No.	Description	Qty	Pwr.	Sensible	Latent	Total
1	Coffee Brewer (12cup/2 burners)	1	100%	1.100	0.560	1.660
2	Coffee brewing urn (large), per litre	1	100%	0.440	0.220	0.660

Sensible Gain: 1.540 kW **Latent Gain: 0.780 kW** **Total Gain: 2.320 kW**

Air Conditioning Load Computation

Date: Tuesday, 7th November 2023 **File:** Heat Gains.awc

Total Heating Load:

Sensible Heat Ratio	Sensible	Latent	Total
0.700	6.968 kW	2.985 kW	9.952 kW