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Heat Loss Report & System Design

Prepared for

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Heat loss report

This section presents the results of our detailed heat loss calculations for your property. The overall heat loss determines how big your heating system needs to be, and the room-by-room breakdown allows us to size the emitters (radiators and underfloor heating) correctly to keep each room warm on a cold day.

Introduction

How quickly your property loses heat depends on how big it is, the materials it is made from, and how air tight it is. Our detailed heat loss survey captured all this information and we have laid it out in this report so you can understand how and why we produce our recommendations. There are several key questions that we're looking to answer as we go through this process for you:

Are the heat pump and radiators big enough?

To keep your property warm, the heat pump needs to deliver heat to the emitters (by which we just mean radiators and underfloor heating) as quickly as your property loses it, and in turn the emitters need to deliver that heat as quickly as each room loses it.

We cannot rely on the fact that your existing radiators keep your property warm with your existing heating system, because heat pumps typically work at a much lower flow temperature than fossil-fuel boilers.

Whilst heat pumps are capable of making very hot water, they work most efficiently when generating low-temperature heat, typically between 35-50C. Gas boilers have traditionally been set up to generate high-temperature heat, with water temperatures of 70-80C (although they also work more efficiently at lower temperatures!).

A lower flow temperature, while more efficient, does mean the heat output from each radiator will be reduced. We use the heat loss survey to calculate how that reduced output compares to the room's demand for heat and then determine which (if any) radiators need replacing. In this way we ensure your new system will run efficiently with a low flow temperature, while still keeping you warm on cold days.

Is the heat pump too big?

This strikes many as a funny question, but we do not want to "oversize" your heat pump. While we design your heating system to ensure it keeps your property warm on cold days, most of the time it isn't that cold! On milder days, your house loses heat more slowly so the heat pump will need to provide less heat.

Heat pumps have to be sized quite precisely, as opposed to the majority of gas or oil boilers which are typically far more powerful than is actually needed for the property. If heat pumps turn on and off all the time, it can be really inefficient and unnecessarily increase energy bills. So we want to choose a model that can keep your property warm on a cold day, but "modulate down" to keep running efficiently on milder days.

We hope this all makes sense! Please do give the report a thorough read through and let us know if you have any questions – we're more than happy to explain what bits mean in more detail if you would like!

Calculation conditions

When calculating the property's heat loss we design to certain conditions. This section shows the conditions used for this property.

Indoor & outdoor

Design outdoor air temperature

-1.7 °C

The "99th percentile" temperature for the area – the outdoor temperature only falls below this 1% of the time.

Indoor temperature

18 °C to 22 °C

The set point the system needs to maintain. The value used in each room is shown in the room by room section.

Design ground temperature

11.3 °C

Average ground temperature across the year, used to calculate heat loss through floors.

Ventilation & infiltration

Air permeability

10.0 m³/hr/m² at 50 Pa

A measure of how much air leaks through the building fabric, expressed as the volume of air per hour per square metre of exposed surface area at a reference pressure of 50 Pa. This value is the starting point for calculating the ventilation heat loss in each room.

Source: Estimated
from survey data

Shielding

Normal

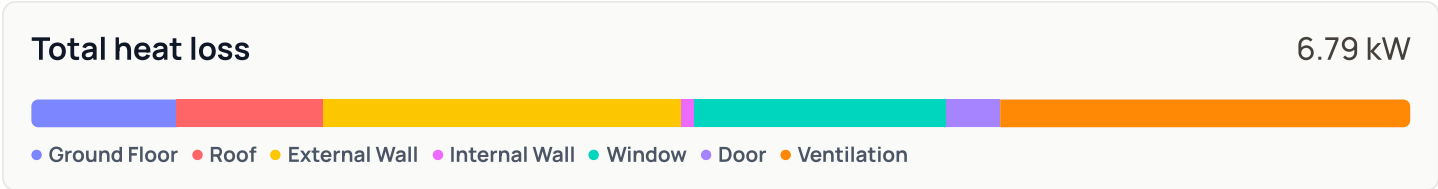
An adjustment to account for how exposed the property is to the wind. Properties in sheltered locations lose less heat through ventilation than those in exposed locations.

All calculations have been done in compliance with BS EN12831 (UK National Annex) and comply with the standards laid out in the Microgeneration Certification Scheme.

HEAT LOSS

Heat loss by element

This section shows the heat loss through each element in the property. They give you a sense of which parts of the property fabric lose the most heat, and may indicate areas where insulating could have a significant impact on the heat loss.



	U-VALUE* (W/m²K)	AREA	HEAT LOSS
Ground Floor • Solid floor. No insulation.	0.05 – 1.17	149.9 m²	711 W
Intermediate Floor/Ceiling • Intermediate floor. no insulation.	1.41 – 1.73	224.9 m²	0 W
Roof • Pitched, 150mm insulation at joists, felted	0.23	151.3 m²	710 W
External Wall • Filled Cavity. Brick and Standard Block (100mm). Plaster	0.45	186.6 m²	1,773 W
Internal Wall • Block - 100mm standard aerated block, plaster. 126mm.	1.06	482.9 m²	0 W
Window 1. Double Glazed Windows 2. Extension 2023-onwards. Maximum value.	1.40 – 1.90	42.7 m²	1,287 W
Door • High performance door - U value 1.6 W/m²K	1.60	6.5 m²	205 W
	ACH**	VOLUME	HEAT LOSS
Ventilation	0.21 – 1.04	585 m³	2,105 W
Total			6.79 kW

* **U-Value:** the thermal conductivity of the element.

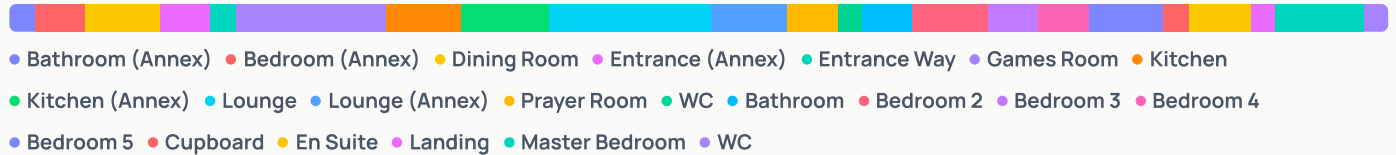
****ACH:** air changes per hour

Heat loss by room

This section shows the heat loss from each room in the property. These results are used to design the emitters (i.e. radiators or underfloor) for the new system.

Total heat loss

6.79 kW



	ROOM TEMP	ACH*	FLOOR AREA	VOLUME	HEAT LOSS	HEAT LOSS PER UNIT AREA
Bathroom (Annex)	22 °C	0.7	1.9 m ²	5 m ³	132 W	68 W/m ²
Bedroom (Annex)	18 °C	0.6	11.8 m ²	28 m ³	250 W	21 W/m ²
Dining Room	21 °C	0.5	19.9 m ²	39 m ³	391 W	20 W/m ²
Entrance (Annex)	18 °C	1.0	3.9 m ²	9 m ³	245 W	63 W/m ²
Entrance Way	18 °C	0.5	3.5 m ²	8 m ³	111 W	32 W/m ²
Games Room	21 °C	0.6	17.1 m ²	39 m ³	751 W	44 W/m ²
Hallway	18 °C	0.2	9.5 m ²	22 m ³	-5 W	-1 W/m ²
Kitchen	18 °C	0.5	20.8 m ²	47 m ³	389 W	19 W/m ²
Kitchen (Annex)	18 °C	0.7	11.0 m ²	26 m ³	413 W	38 W/m ²
Lounge	21 °C	0.5	29.7 m ²	68 m ³	846 W	28 W/m ²
Lounge (Annex)	21 °C	0.6	9.9 m ²	24 m ³	369 W	37 W/m ²
Prayer Room	21 °C	0.5	6.7 m ²	15 m ³	234 W	35 W/m ²
WC	22 °C	0.5	4.1 m ²	9 m ³	106 W	26 W/m ²
Bathroom	22 °C	0.5	6.9 m ²	16 m ³	261 W	38 W/m ²
Bedroom 2	18 °C	0.5	14.2 m ²	34 m ³	382 W	27 W/m ²
Bedroom 3	18 °C	0.5	9.3 m ²	22 m ³	209 W	22 W/m ²
Bedroom 4	18 °C	0.5	12.0 m ²	27 m ³	211 W	18 W/m ²
Bedroom 5	18 °C	0.5	16.5 m ²	38 m ³	398 W	24 W/m ²
Cupboard	18 °C	0.4	4.0 m ²	10 m ³	80 W	20 W/m ²
Cylinder Cupboard	18 °C	0.2	2.7 m ²	6 m ³	-3 W	-1 W/m ²
En Suite	22 °C	0.6	7.7 m ²	17 m ³	337 W	44 W/m ²

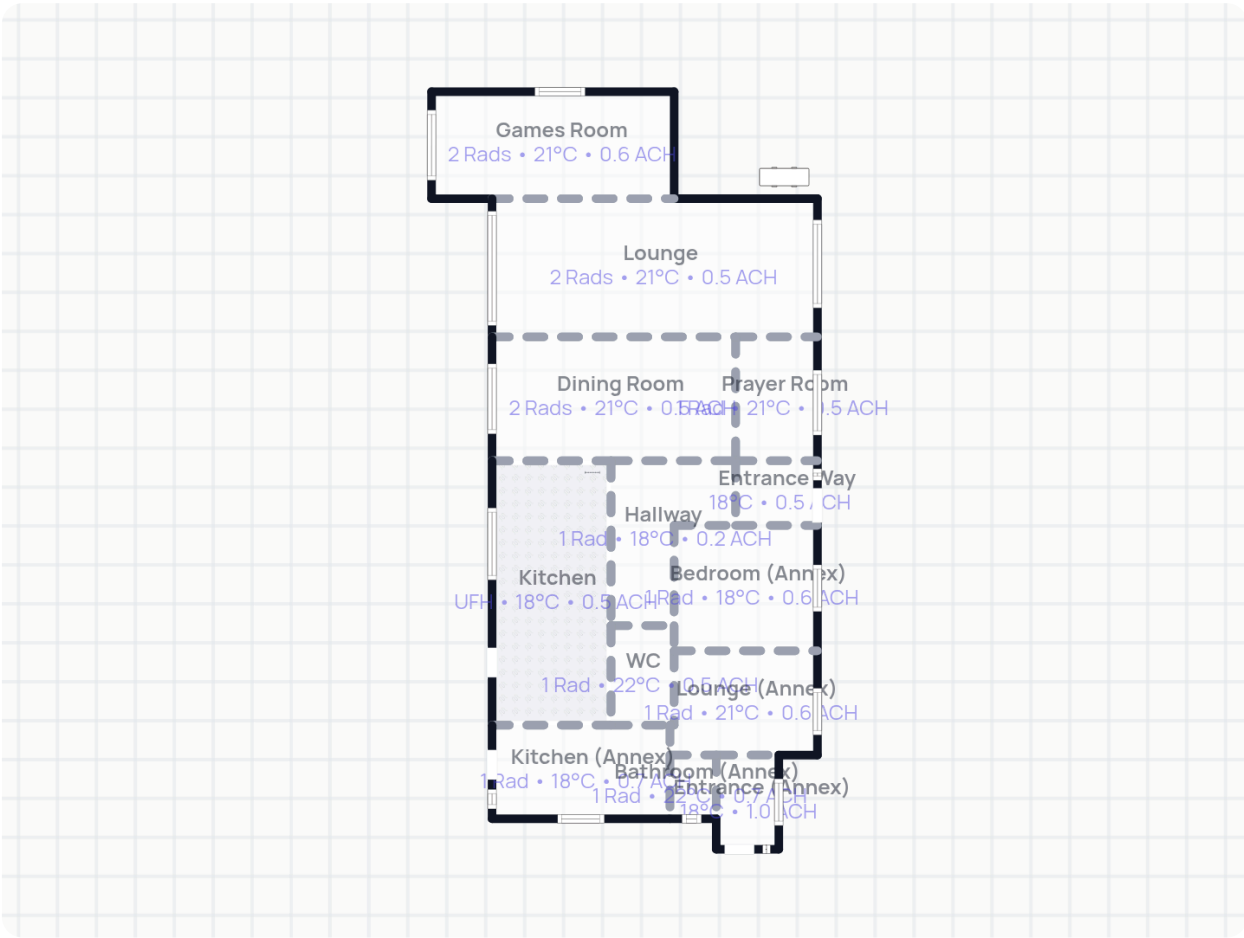
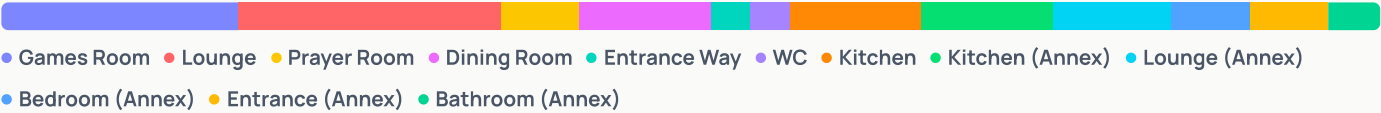
	ROOM TEMP	ACH*	FLOOR AREA	VOLUME	HEAT LOSS	HEAT LOSS PER UNIT AREA
Landing	18 °C	0.2	12.3 m²	28 m³	113 W	9 W/m²
Master Bedroom	18 °C	0.5	25.5 m²	40 m³	474 W	19 W/m²
WC	22 °C	0.5	2.5 m²	6 m³	100 W	41 W/m²

*ACH: air changes per hour

Ground floor

Heat loss by room

4232 W

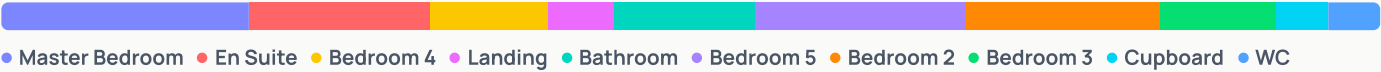


Rads: number of radiators
UFH: underfloor heating in room
°C: room temperature
ACH: air changes per hour
W: number of windows
D: number of doors

First floor

Heat loss by room

2562 W



Rads: number of radiators
UFH: underfloor heating in room
°C: room temperature
ACH: air changes per hour
W: number of windows
D: number of doors

Ventilation heat loss breakdown

This section shows how much heat escapes with warm air leaving the building. This is calculated from the building's air permeability — how draughty it is overall — then distributed across rooms by their exposed surface area.

Whole home permeability

At 50 Pa

10.0 m³/hr/m²

At normal conditions

0.50 m³/hr/m²

This figure is estimated based on the following contribution from each part of the property (each at 50 Pa, in m³/hr/m²):

Structural Masonry	+ 7.0
Floor Sealed	+ 0.0
Doors & windows 100% draught-proofed	+ 2.0
Storeys 2 storeys	+ 1.0
Total	= 10.0

Calculation factors

Shielding Normal
 How exposed the property is to the wind. Sheltered locations lose less heat through ventilation than exposed ones.

Zone height Between 5m and 10m
 The building's total height across all floors, used to determine the shielding factor.

Shielding factor (50Pa to normal conditions conversion) 0.05
 We multiply 50 Pa permeability by this factor to derive the value at normal conditions.

	EXPOSED AREA	INFILTRATION EX. VENTS	VENTS	INFILTRATION FROM VENTS	TOTAL INFILTRATION	VOLUME	ACH*
Games Room	47 m²	24 m³/hr	—	—	24 m³/hr	39 m³	0.61 /hr
Lounge	54 m²	27 m³/hr	—	—	27 m³/hr	68 m³	0.50 /hr
Prayer Room	14 m²	7 m³/hr	—	—	7 m³/hr	15 m³	0.50 /hr
Dining Room	26 m²	13 m³/hr	—	—	13 m³/hr	39 m³	0.50 /hr
Entrance Way	7 m²	4 m³/hr	—	—	4 m³/hr	8 m³	0.46 /hr
Hallway	9 m²	5 m³/hr	—	—	5 m³/hr	22 m³	0.22 /hr
WC	4 m²	2 m³/hr	—	—	2 m³/hr	9 m³	0.50 /hr
Kitchen	36 m²	18 m³/hr	Cooker hood	3 m³/hr	21 m³/hr	47 m³	0.50 /hr
Kitchen (Annex)	39 m²	19 m³/hr	—	—	19 m³/hr	26 m³	0.73 /hr

	EXPOSED AREA	INFILTRATION EX. VENTS	VENTS	INFILTRATION FROM VENTS	TOTAL INFILTRATION	VOLUME	ACH*
Lounge (Annex)	29 m ²	14 m ³ /hr	—	—	14 m ³ /hr	24 m ³	0.60 /hr
Bedroom (Annex)	31 m ²	16 m ³ /hr	—	—	16 m ³ /hr	28 m ³	0.55 /hr
Entrance (Annex)	19 m ²	10 m ³ /hr	—	—	10 m ³ /hr	9 m ³	1.04 /hr
Bathroom (Annex)	7 m ²	3 m ³ /hr	—	—	3 m ³ /hr	5 m ³	0.72 /hr
Master Bedroom	44 m ²	22 m ³ /hr	—	—	22 m ³ /hr	40 m ³	0.55 /hr
En Suite	20 m ²	10 m ³ /hr	—	—	10 m ³ /hr	17 m ³	0.59 /hr
Bedroom 4	21 m ²	10 m ³ /hr	—	—	10 m ³ /hr	27 m ³	0.50 /hr
Landing	12 m ²	6 m ³ /hr	—	—	6 m ³ /hr	28 m ³	0.22 /hr
Bathroom	14 m ²	7 m ³ /hr	—	—	7 m ³ /hr	16 m ³	0.50 /hr
Bedroom 5	34 m ²	17 m ³ /hr	—	—	17 m ³ /hr	38 m ³	0.50 /hr
Cylinder Cupboard	3 m ²	1 m ³ /hr	—	—	1 m ³ /hr	6 m ³	0.21 /hr
Bedroom 2	34 m ²	17 m ³ /hr	—	—	17 m ³ /hr	34 m ³	0.50 /hr
Bedroom 3	17 m ²	8 m ³ /hr	—	—	8 m ³ /hr	22 m ³	0.50 /hr
Cupboard	8 m ²	4 m ³ /hr	—	—	4 m ³ /hr	10 m ³	0.41 /hr
WC	5 m ²	3 m ³ /hr	—	—	3 m ³ /hr	6 m ³	0.50 /hr

*ACH: the number of air changes per hour that the room sees. This is calculated based on the infiltration values.

System design

This section presents our proposed system design for the property. The design is based on the detailed room by room calculations in the previous section.

Proposed heat pump

Based on the property's design heat loss of 6.79kW and on all the attributes of the property that we know of at this stage, we would suggest the following heat pump.

Samsung Mono R290 Pump Integrated 8kW

Capacity at 45 °C (-1.7 °C)	7.86 kW
SCOP at 45 °C	4.04
Flow temperature	45 °C

This heat pump covers **116 %** of the heating requirement at and above the design temperature of **-1.7 °C**. The heat pump will be run on weather compensation so the efficiency will be higher when the weather is milder.

MCS certificate number

011-1W0687_3

Refrigerant

R290

Model number

AE080CXYBEK/EU

Sound power

59 dB(A)

Width

1270 mm

Height

850 mm

Depth

500 mm

Weight

125 kg

Capacity (kW)

OUTSIDE TEMP	35°C	40°C	45°C	50°C	55°C
-10°C	7.41	7.37	7.32	7.31	7.3
-7°C	7.5	7.49	7.48	7.47	7.45
-2°C	7.8	7.83	7.85	7.78	7.7
2°C	7.95	7.95	7.95	7.95	7.95
7°C	8	8	8	8	8

Seasonal Coefficient of Performance (SCOP)

SCOP is the average coefficient of performance over the heating season, accounting for the variation in outdoor temperature. Manufacturers have to test their equipment in standard conditions and report their SCOP performance data to be eligible for certification.

	35°	40°	45°	50°	55°
SCOP	4.66	4.35	4.04	3.72	3.41

Location

Side of Property next to Garage

- Mounting location: Ground
- Base to be built by: Use existing
- Condensate drain: Soakaway to be dug



Emitters

Emitters (i.e., radiators/fan coils/underfloor heating) are a vital part of the heating system. They take the heat produced by the heat source and distribute that heat around the property.

Based on the room by room heat loss results, we propose the following emitter design for the property. This design will ensure each room can be heated to its set point when it's -1.7 °C outside whilst maintaining high system efficiency.

Design conditions

- Flow temperature = 45 °C
- Temperature drop across the radiator (delta T) = 5 °C
- Mean radiator temperature = 42.5 °C
- UFH mean water temperatures (MWT):
 - Manifold 1 = 42.5 °C

Current emitters in the property

ROOM	IMAGE	TYPE	DETAILS	EMITTER OUTPUT	ROOM OUTPUT	ROOM DEMAND	% DEMAND MET*
Games Room		Radiator	Type 22 (K2) 1800 x 600 mm	742 W	1452 W	751 W	193 %
		Radiator	VITA PLAN VERTICAL CONCEPT 1800 x 600 mm	710 W			
Lounge		Radiator	Type 22 (K2) 1600 x 600 mm	681 W	1046 W	846 W	124 %
		Radiator	Type 11 (K1) 600 x 1200 mm	365 W			
Prayer Room		Radiator	Type 10 (P1) 600 x 1600 mm	298 W	298 W	234 W	127 %
Dining Room		Radiator	Type 22 (K2) 600 x 1400 mm	764 W	1129 W	391 W	289 %
		Radiator	Type 11 (K1) 600 x 1200 mm	365 W			
Entrance Way		–		0 W	0 W	111 W	0 %
Hallway		Radiator	Type 10 (P1) 600 x 800 mm	177 W	177 W	-5 W	100 %
WC		Radiator	Straight towel rail 760 x 600 mm	140 W	140 W	106 W	132 %
Kitchen		UFH	Solid (Screed) - Vinyl tiles, 2mm (0W/m²K) 150mm centres 42.5°C MWT	2913 W	2913 W	389 W	749 %
Kitchen (Annex)		Radiator	Type 22 (K2) 1800 x 400 mm	589 W	589 W	413 W	143 %
Lounge (Annex)		Radiator	Type 22 (K2) 600 x 1300 mm	710 W	710 W	369 W	192 %
Bedroom (Annex)		Radiator	Type 22 (K2) 600 x 1300 mm	844 W	844 W	250 W	338 %
Entrance (Annex)		–		0 W	0 W	245 W	0 %
Bathroom (Annex)		Radiator	Straight towel rail 803 x 500 mm	79 W	79 W	132 W	60 %
Master Bedroom		Radiator	Type 22 (K2) 1800 x 400 mm	589 W	854 W	474 W	180 %

ROOM	IMAGE	TYPE	DETAILS	EMITTER OUTPUT	ROOM OUTPUT	ROOM DEMAND	% DEMAND MET*
En Suite		Radiator	Type 10 (P1) 600 x 1200 mm	265 W			
		–		0 W	0 W	337 W	0 %
Bedroom 4		Radiator	Type 33 (K3) 600 x 1500 mm	1342 W	1342 W	211 W	636 %
Landing		Radiator	Type 10 (P1) 600 x 1200 mm	265 W	265 W	113 W	235 %
Bathroom		Radiator	Type 22 (K2) 1600 x 500 mm	532 W	532 W	261 W	204 %
Bedroom 5		Radiator	Type 22 (K2) 600 x 1600 mm	1039 W	1328 W	398 W	334 %
		Radiator	Type 11 (K1) 600 x 800 mm	289 W			
Cylinder Cupboard		–		0 W	0 W	-3 W	100 %
Bedroom 2		Radiator	Type 22 (K2) 600 x 1400 mm	909 W	909 W	382 W	238 %
Bedroom 3		Radiator	Type 22 (K2) 600 x 1400 mm	909 W	909 W	209 W	435 %
Cupboard		–		0 W	0 W	80 W	0 %
WC		–		0 W	0 W	100 W	0 %

*% demand met: This is calculated for a day when the outdoor temperature is -1.7 °C and the flow temperature is 45.0 °C.

Proposed emitter changes

ROOM	STATUS	IMAGE	TYPE	DETAILS	EMITTER OUTPUT	ROOM DEMAND	% DEMAND MET*
Games Room	Keep		Radiator	Type 22 (K2) 1800 x 600 mm	742 W	751 W	193 %
	Keep		Radiator	VITA PLAN VERTICAL CONCEPT 1800 x 600 mm	710 W		
Lounge	Keep		Radiator	Type 22 (K2) 1600 x 600 mm	681 W	846 W	124 %
	Keep		Radiator	Type 11 (K1) 600 x 1200 mm	365 W		
Prayer Room	Keep		Radiator	Type 10 (P1) 600 x 1600 mm	298 W	234 W	127 %
Dining Room	Keep		Radiator	Type 22 (K2) 600 x 1400 mm	764 W	391 W	289 %
	Keep		Radiator	Type 11 (K1) 600 x 1200 mm	365 W		
Entrance Way			–		0 W	111 W	0 %**
Hallway	Keep		Radiator	Type 10 (P1) 600 x 800 mm	177 W	-5 W	100 %
WC	Keep		Radiator	Straight towel rail 760 x 600 mm	140 W	106 W	132 %
Kitchen	Keep		UFH	Solid (Screed) - Vinyl tiles, 2mm (0W/m²K) 150mm centres 42.5°C MWT	2913 W	389 W	749 %
Kitchen (Annex)	Keep		Radiator	Type 22 (K2) 1800 x 400 mm	589 W	413 W	143 %
Lounge (Annex)	Keep		Radiator	Type 22 (K2) 600 x 1300 mm	710 W	369 W	192 %
Bedroom (Annex)	Keep		Radiator	Type 22 (K2) 600 x 1300 mm	844 W	250 W	338 %
Entrance (Annex)			–		0 W	245 W	0 %**
Bathroom (Annex)	Keep		Radiator	Straight towel rail 803 x 500 mm	79 W	132 W	60 %**
Master Bedroom	Keep		Radiator	Type 22 (K2) 1800 x 400 mm	589 W	474 W	180 %

ROOM	STATUS	IMAGE	TYPE	DETAILS	EMITTER OUTPUT	ROOM DEMAND	% DEMAND MET*
En Suite	Keep		Radiator	Type 10 (P1) 600 x 1200 mm	265 W		
			–		0 W	337 W	0 %**
Bedroom 4	Keep		Radiator	Type 33 (K3) 600 x 1500 mm	1342 W	211 W	636 %
Landing	Keep		Radiator	Type 10 (P1) 600 x 1200 mm	265 W	113 W	235 %
Bathroom	Keep		Radiator	Type 22 (K2) 1600 x 500 mm	532 W	261 W	204 %
Bedroom 5	Keep		Radiator	Type 22 (K2) 600 x 1600 mm	1039 W	398 W	334 %
Cylinder Cupboard	Keep		Radiator	Type 11 (K1) 600 x 800 mm	289 W		
			–		0 W	-3 W	100 %
Bedroom 2	Keep		Radiator	Type 22 (K2) 600 x 1400 mm	909 W	382 W	238 %
Bedroom 3	Keep		Radiator	Type 22 (K2) 600 x 1400 mm	909 W	209 W	435 %
Cupboard			–		0 W	80 W	0 %**
WC			–		0 W	100 W	0 %**

*% demand met: This is calculated for a day when the outdoor temperature is -1.7 °C and the flow temperature is 45.0 °C.

** Accepting undersized emitters

Please note that the emitters do not meet the room heat demand in all cases. This means that the following rooms will not reach their set point temperature at the design flow temperature. If you choose to go ahead, you are acknowledging that you are happy with the above. If that doesn't sound right please contact us before proceeding with the install.

Entrance Way

Entrance (Annex)

Bathroom (Annex)

En Suite

Cupboard

WC

Hot water

The heat pump will provide **100%** of the hot water requirement. Heat pumps cannot create heat as quickly as combi boilers, so they can't heat up hot water instantaneously when you need it. Instead we install a cylinder which stores hot water so it's always ready when you need it.

Proposed cylinder model

We've selected the following hot water cylinder based on the number of bedrooms in the property.

300L CYLINDER ELITE UK C ESHPD3300

Capacity

300 litres

Cylinder location

1st floor



Hot water performance calculations

The calculation below shows how much electricity we expect the heat pump to use for providing hot water. The calculations are based on typical usage.

Total electricity per year for hot water1,294 kWh

Annual demand		Legionella cycles	
Volume per day	180 litres/day	Volume per cycle	300 litres
Assumed mains water temp	10 °C	Tank starting temperature	50 °C
Storage temp	50 °C	Legionella set point	60 °C
Distribution efficiency	70 %	Distribution efficiency	70 %
Heat demand per day	11.96 kWh	Heat demand per cycle	4.98 kWh
Days per year	365 days	Cycles per year	52
Heat demand per year	4,366 kWh	Heat provided by legionella cycles per year	259 kWh

Electricity consumption	
Legionella cycle provided by	Heat pump
Heat energy provided by legionella cycle	259 kWh
Legionella cycle efficiency	289 %
Electricity consumption - legionella	90 kWh
Remaining heat demand	4,107 kWh
Hot water efficiency - normal operation	341 %
Electricity consumption - normal operation	1,204 kWh
Total electricity consumption	1,294 kWh
Overall efficiency	337 %

Reheat time1 h 49 min

Once depleted, it will take the cylinder 1 h 49 min to fully reheat based on the following inputs:	
Cylinder volume	300 litres

Mains water temp	10 °C
Hot water storage temp	50 °C
Heating power	7.72 kW

Sound assessment

Pass

To class as "permitted development" the heat pump design must comply with regulations regarding the sound level at a neighbour's nearest window/door. This section presents the results of the sound assessment we've conducted for the proposed heat pump and location, as set out in [MCS 020a v1.0](#)

This assessment accounts for:

- The sound level of the heat pump itself
- The influence of the space that it is in
- Any barriers between the heat pump and the assessment position

Results by position

Position 1

29 dB

Pass

SOUND ASSESSMENT

Position 1

10m from neighbouring property



Sound pressure level – Samsung Mono R290 Pump Integrated 8kW AE080CXYBEK/EU

Sound power level	59 dB(A)
Reduction due to distance	25 dB(A)
Reflective surfaces: two reflecting surfaces (Q=4)	
Distance (heat pump to assessment position): 10 m	
Reduction due to barriers	5 dB(A)
Partial line of sight, Solid brick/masonry wall or fence more than 18mm thick	
Total	29 dB(A)

Result

Pass

Maximum allowed value	37 dB(A)
Final result at assessment position	29 dB(A)

Performance estimate

Predicting running costs with a heat pump is hard as it depends on a lot of factors, many of which are outside our control. But it's clearly really important that you're able to make an informed decision. So in this section we give you our best estimate of what the running costs and carbon savings will look like for the property if and when you switch to a heat pump.

We then provide an in-depth description of how we've calculated these figures in case you want to dig into the details. Please do ask us if anything doesn't make sense!

Summary

Bills

Current	£1,151 to £1,715
Proposed system	£1,058 to £1,998

Savings **-£283 to £144**

Carbon

Current	4.6 to 6.8 tonnes CO ₂
Proposed system	0.7 to 1.0 tonnes CO ₂

Savings **85%**

Detailed results

The running costs and carbon emissions of a heating system depends on a few key factors, all of which are explained in (even) more detail further down this report:

1. Your property's heating and hot water demand

This is how much heat your property needs for heating and hot water in the year irrespective of what heating system is used to provide it. It's surprisingly hard to put a definitive number on this because it depends on how often you have the heating on and at what temperature, how much hot water you use, and the weather outside.

Given this uncertainty we have estimated this in 2 different ways to try and give you the best understanding:

- **Heating Degree Days** – Based on the heat loss calculations we have done combined with “heating degree day” data which represents the typical annual weather pattern in the area.
- **Last year's consumption** – Based on the Mains gas consumption of the property last year. If nothing has changed about the property or heating pattern, this should be a pretty representative estimate.

We would usually also provide an estimate based on the EPC but we can't do that in this case because a representative EPC cannot be obtained for this property because of planned building work.

2. The efficiency of your system

The efficiency of your system describes how much heat your system makes from what you pay for (electricity/gas/oil), both in heating and when making hot water. This depends on the system design, install quality, and how you run the system. We've included two sets of numbers here. One using fixed efficiencies from MCS and another using the Manufacturer's tested values.

The MCS estimate uses standard efficiency values, which are the same for all heat pumps and only depend on the flow temperature the system is designed at. They tend to be more conservative. Manufacturer's efficiencies use their test data at standard conditions. We've included both to give you a fair picture of what to expect.

3. Energy prices

Heat pump running costs depend on the price of electricity, and the comparison with your old system depends on the price of mains gas. We've included numbers both at the price cap and with a heat pump tariff, to show the range of what you might pay depending on the tariff you are on. We've included more info on heat pump tariffs further down.

4. Emission factors

Emission factors show how much carbon dioxide is emitted per unit of energy provided by a fuel. They are a measure of how “clean” a fuel is.

MCS031 Performance estimate

The table below shows a performance estimate in MCS's required table layout following the methodology laid out in MCS 031 Issue 4.0.

Heat Pump System Performance Estimate	
Your energy requirements	
Energy required for heating	15,583 kWh
Demand to be supplied by the heat pump	15,583 kWh
Energy required for hot water	4,366 kWh
Demand to be supplied by the heat pump	4,366 kWh
Your property	
Your postcode prefix	RG
Total property floorspace (not property footprint)	264 m ²
Average watts per square metre	26 W/m ²
Note: W/m ² is a measure of your property's thermal efficiency. 0-30W/m ² is very low heat loss and 120-150W/m ² is very high heat loss.	
Proposed system	
Heat pump capacity	7.9 kW
Heat pump type	ASHP
Your system is proposed to provide:	Space heat and hot water
Your proposed heating system will be (select one):	Your existing radiators (none upgraded)
The proposed flow temperature will be	45 °C
Performance	
The Seasonal Performance Factor is calculated to be:	3.4
Estimate of energy consumption of the proposed heat pump (or combined system where Hybrid).	High: 7,866 kWh → Low: 6,436 kWh
Note: you can convert these figures to approximate running costs.	
Important Note: This is not a detailed system design. It offers a reasonable estimate of likely performance and a description of the likely design. This estimate is based on a full heat loss survey and design.	
Applicable warning notes (from Table 2): No change to existing radiators is unlikely to be viable - unless the current radiators are significantly over-sized for your existing fossil fuel boiler.	

Results table - Manufacturer's efficiencies

This table shows a granular breakdown of the potential energy consumption and running costs of your heat pump, based on different estimates of your property's energy demand and different energy tariffs that you might choose. We are also using heat pump efficiencies (i.e. SCOP) based on the manufacturer's test data, which often shows higher efficiencies than MCS's fixed values.

Warning: In accordance with MCS standards you should treat any performance estimate that differs from the MCS031 calculations with caution. We have included it because we think it's helpful to show you how different estimates of your heating demand affect the overall performance, how the tariff you choose can affect the running costs of the system, and the potential efficiency of the heat pump based on the manufacturer's own test data.

If you have any questions about this, please do let us know and we'll be happy to talk you through it.

	BASED ON HEAT LOSS CALCULATIONS AND HEATING DEGREE DAYS		BASED ON LAST YEARS CONSUMPTION		BASED ON EPC
Bills	Existing (Mains gas)*	Heat pump (Electricity)	Existing (Mains gas)*	Heat pump (Electricity)	Unavailable
Price cap (26.11 p/kWh)	£1,151	£1,345 -£194	£1,715	£1,998 -£283	
Octopus Cosy (20.53 p/kWh)	£1,151	£1,058 £93	£1,715	£1,571 £144	
Your Tariff (24.65 p/kWh)	£1,151	£1,270 -£119	£1,715	£1,886 -£171	

* Based on an existing Mains gas price of 5.31 p/kWh

Carbon	Existing (Mains gas)	Heat pump (Electricity)	Existing (Mains gas)	Heat pump (Electricity)	Unavailable
Totals	4,554 kg	701 kg 3,853 kg	6,781 kg	1,041 kg 5,740 kg	

Consumption	Existing (Mains gas)	Heat pump (Electricity)	Existing (Mains gas)	Heat pump (Electricity)	Unavailable
Heating	16,938 kWh	3,857 kWh	25,224 kWh	5,744 kWh	
Hot Water	4,746 kWh	1,294 kWh	7,068 kWh	1,907 kWh	
Total	21,684 kWh	5,151 kWh	32,292 kWh	7,651 kWh	

Demand			Unavailable
Heating	15,583 kWh	23,206 kWh	
Hot Water	4,366 kWh	6,502 kWh	
Total	19,949 kWh	29,709 kWh	

Efficiency	Existing (Mains gas)	Heat pump (Electricity)	Existing (Mains gas)	Heat pump (Electricity)	Unavailable
Heating	92 %	404 %	92 %	404 %	
Hot water	92 %	337 %	92 %	341 %	

Inputs and assumptions

In each of the following sections, we break down how we've calculated the numbers that appear in the results table.

Heat energy required

To work out how much energy the property needs to keep it warm, we first have to work out how much heat is required. That might sound strange, but because different heating sources have wildly different efficiencies, this heat energy number will need to be divided by the system efficiency (see next section) to calculate the actual energy required.

	BASED ON HEAT LOSS CALCULATIONS AND HEATING DEGREE DAYS	BASED ON LAST YEARS CONSUMPTION	BASED ON EPC
	2033 degree days, 319 W/°C	32292 kWh mains gas, 92% efficiency	Unavailable
Heating	15,583 kWh	23,206 kWh	
Hot water	4,366 kWh	6,502 kWh	
Total	19,949 kWh	29,709 kWh	

System efficiency

The efficiency of a heating system describes how much useful output (heat) you get per unit of what you pay for (electricity/gas/oil). A system's efficiency will often be different when it is doing space heating vs. when it's making hot water because the temperature that the system is heating the water to is often hotter in water heating cycles. We have used the following inputs when modelling the system.

Existing heating system

Existing heating system fuel:	Mains gas
Efficiency - space heating:	92%
Efficiency - hot water:	92%

Heat pump system

Type of system:	Air source heat pump	
Model:	Samsung Mono R290 Pump Integrated 8kW	
MCS certificate numbers:	011-1W0687_3	
Flow temperature - space heating:	45°C	
Flow temperature - hot water:	55°C	
	MCS SPF	MANUFACTURERS SCOP
Heating efficiency	340 %	404 %
Hot water efficiency	170 %	337 %

Energy prices

As the last few years have shown, energy prices are very hard to predict. In modelling bills we have used the current energy price cap and also shown you a few different heat pump tariff options. Energy tariffs can also vary by supplier and change over time, so we'd recommend not making your decision based purely on a specific tariff or running cost figure.

There are an increasing number of heat pump tariffs that give you access to cheaper electricity. These are typically **time of use** tariffs which charge you different amounts depending on when you use the electricity. So you can set the hot water heating schedule (and to a lesser extent the space heating schedule) to make use of lower prices.

If you have solar (or are planning to install it), the electricity prices will also be lower because the heat pump will use some of the electricity that the solar is generating. This is especially true for hot water consumption because you can schedule the hot water to run in the middle of the day.

MAINS GAS

Existing price	5.31 p/kWh
----------------	------------

ELECTRICITY

Price cap	26.11 p/kWh
-----------	-------------

Price cap 1st July - 30th September 2026

<u>Octopus Cosy</u>	20.53 p/kWh
---------------------	-------------

Based on Octopus's expectations of customer consumption patterns on the Cosy Octopus tariff as of April 2026

Your tariff	24.65 p/kWh
-------------	-------------

Emission factors

We've used the emission factors from the government's SAP 2010 methodology. For mains gas this value is fixed but for electricity it is falling over time as the grid decarbonises. This means the system will get cleaner and cleaner. The value used here is based on a projected continued reduction in grid carbon intensity.

Mains gas**210** gCO₂/kWh**Electricity****136** gCO₂/kWh

Dependence of performance on flow temperature

How much electricity the heat pump will use to provide heating depends on the flow temperature that the system runs at. We have designed the system to run at 45°C when it's -1.7°C outside and we'll set it up to use weather compensation so it runs more efficiently at milder temperatures.

To demonstrate the importance of flow temperature, the table below shows how much electricity the system would consume to provide heating at a range of flow temperatures. This graph is based on the heat loss calculations and heating degree days based estimate, but the pattern would be similar for any of the inputs.

	35°	40°	45°	50°	55°
SCOP	4.66	4.35	4.04	3.72	3.41
Electricity consumed (kWh/year)	4281	4586	4938	5363	5850

MCS Key facts - Energy Performance Estimate

Predicting the heat demand of a building, and therefore the performance and running costs of heating systems, is difficult to predict with certainty due to the variables discussed here. These variables apply to all types of heating systems, although the efficiency of heat pumps is more sensitive to good system design and installation. For these reasons your estimate is given as guidance only and should not be considered as a guarantee.

Seasonal Coefficient of Performance:

MCS Seasonal Coefficient of Performance (SCoP) is derived from the EU ErP labelling requirements, and is a theoretical indication of the anticipated efficiency of a heat pump over a whole year using standard (i.e. not local) climate data for 3 locations in Europe. It is used to compare the relative performance of heat pumps under fixed conditions and indicates the units of total heat energy generated (output) for each unit of electricity consumed (input). As a guide, a heat pump with a MCS SCoP of 3 indicates that 3 kWh of heat energy would be generated for every 1 kWh of electrical energy it consumes over a 'standard' annual cycle.

Energy Performance Estimate

An Energy Performance Certificate (EPC) is produced in accordance with a methodology approved by the government. As with all such calculations, it relies on the accuracy of the information input. Some of this information, such as the insulating and air tightness properties of the building may have to be assumed and this can affect the final figures significantly leading to uncertainty especially with irregular or unusual buildings.

Identifying the uncertainties of energy predictions for heating systems

We have identified 3 key types of factor that can affect how much energy a heating system will consume and how much energy it will deliver into a property. These are 'Fixed', 'Variable' and 'Random'. Most factors are common to ALL heating systems regardless of the type (e.g oil, gas, solid fuel, heat pump etc.) although the degree of effect varies between different types of heating system as given in the following table.

The combined effect of these factors on energy consumption and the running costs makes overall predictions difficult however an accuracy $\pm 25-30\%$ would not be unreasonable in many instances. Under some conditions even this could be exceeded (e.g. considerable opening of windows). Therefore it is advised that when making choices based on mainly financial criteria (e.g. payback based on capital cost versus net benefits such as fuel savings and financial incentives) this variability is taken into account as it could extend paybacks well beyond the period of any incentives received, intended occupancy period, finance agreement period etc.

'Fixed' which include:

Factor	Impact
Equipment Selection Performance figures (SCoP) from ErP data	System Efficiency
Energy Assessment via the EPC (e.g. assumptions as to fabric construction and levels of insulation; the variation in knowledge and experience of Energy Assessors)	Energy Required

'Variable' which are affected by the system design and include:

Factor	Impact
Accuracy of sizing of heat pump-i.e. closeness of unit output selection (kW) to demand heat requirement (kW)	System Efficiency
Design space and ambient (external) temperatures	Energy Required
Design flow / return water temperatures and weather compensation	System Efficiency
Type of Heat emitter (e.g. Under-floor; natural convector (e.g. radiator), fan convector etc.)	System Efficiency

'Random' which cannot be anticipated and include:

Factor	Impact
User behaviour:	
• Room temperature settings	Energy Required
• Hot water usage and temperature settings	Energy Required
• Occupancy patterns/times	Energy Required
• Changing the design HP flow temperatures	System Efficiency
• Ventilation (i.e. opening windows)	Energy Required
Annual climatic variations (i.e. warmer and colder years than average)	Energy Required

Key

The statement at the end of each item indicates the major factor affected as follows:

Energy Required: the heat energy output requirement of the system which directly impacts on running costs. This requirement exists regardless of the heating system chosen as it is the heat required to keep the space comfortable. Opening windows or increasing room temperatures will demand more heat output, which means more energy input but this would NOT directly affect the efficiency. Thus increased energy demand does NOT automatically mean reduced efficiency.

System Efficiency: the efficiency of the system has been directly affected and will therefore demand more input energy to achieve the same heat output thus increasing running costs. However, increased energy input does NOT necessarily mean lower system efficiency (see above).

Drawing set

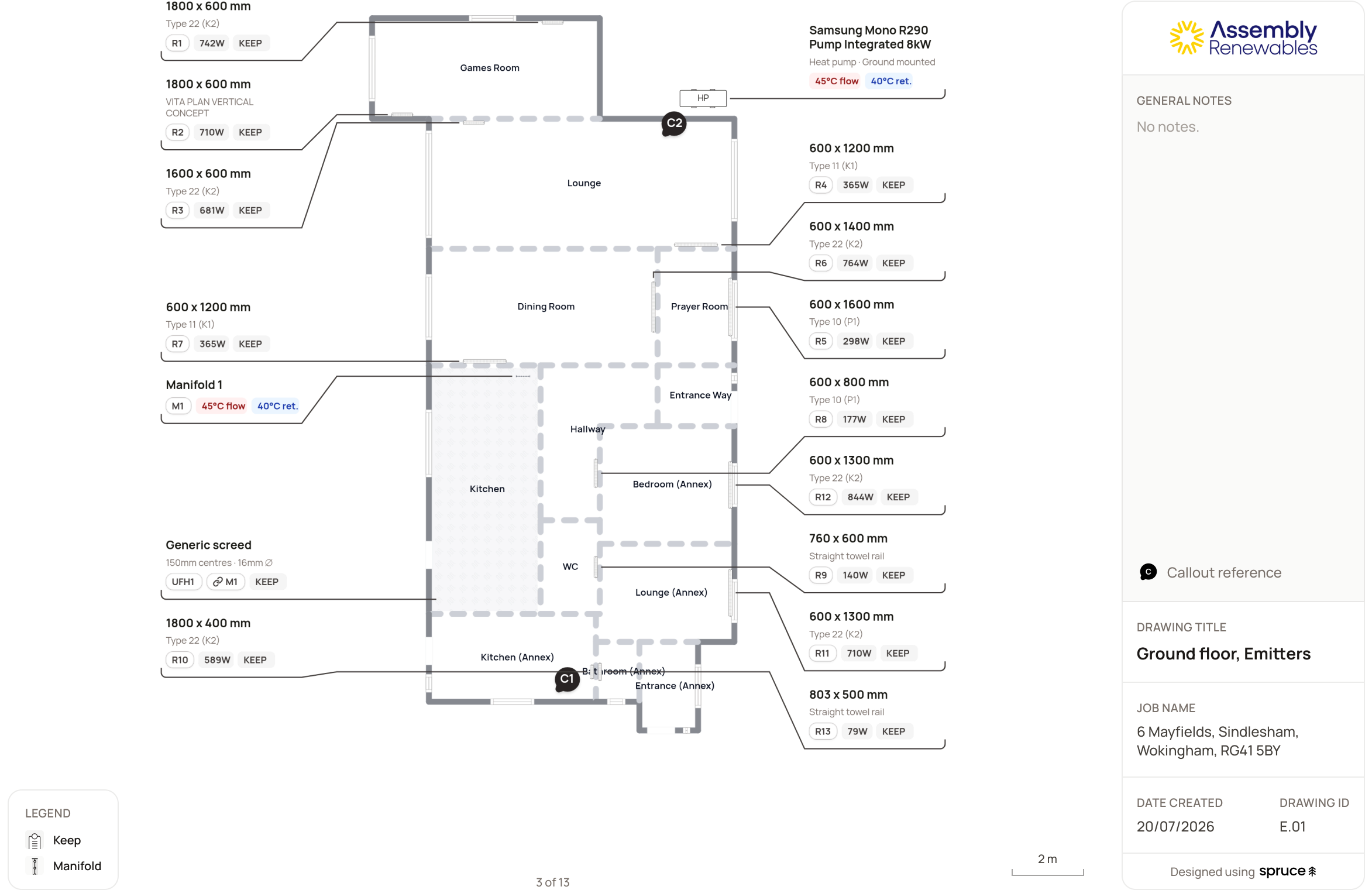
6 Mayfields, Sindlesham, Wokingham, RG41 5BY

Contents

6 Mayfields, Sindlesham, Wokingham, RG41 5BY



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GENERAL NOTES

No notes.

 Callout reference

DRAWING TITLE

First floor, Emitters

JOB NAME

6 Mayfields, Sindlesham,
Wokingham, RG41 5BY

DATE CREATED

20/07/2026

DRAWING ID

E.02

Designed using **spruce** 

600 x 800 mm

Type 11 (K1)

R20 289W **KEEP**

600 x 1600 mm

Type 22 (K2)

R19 1039W **KEEP**

600 x 1200 mm

Type 10 (P1)

R17 265W **KEEP**

1600 x 500 mm

Type 22 (K2)

R18 532W **KEEP**

600 x 1500 mm

Type 33 (K3)

R16 1342W **KEEP**

600 x 1400 mm

Type 22 (K2)

R21 909W **KEEP**

600 x 1400 mm

Type 22 (K2)

R22 909W **KEEP**

**300L CYLINDER
ELITE UK C
ESHDP3300**

Hot water cylinder

300 L

1800 x 400 mm

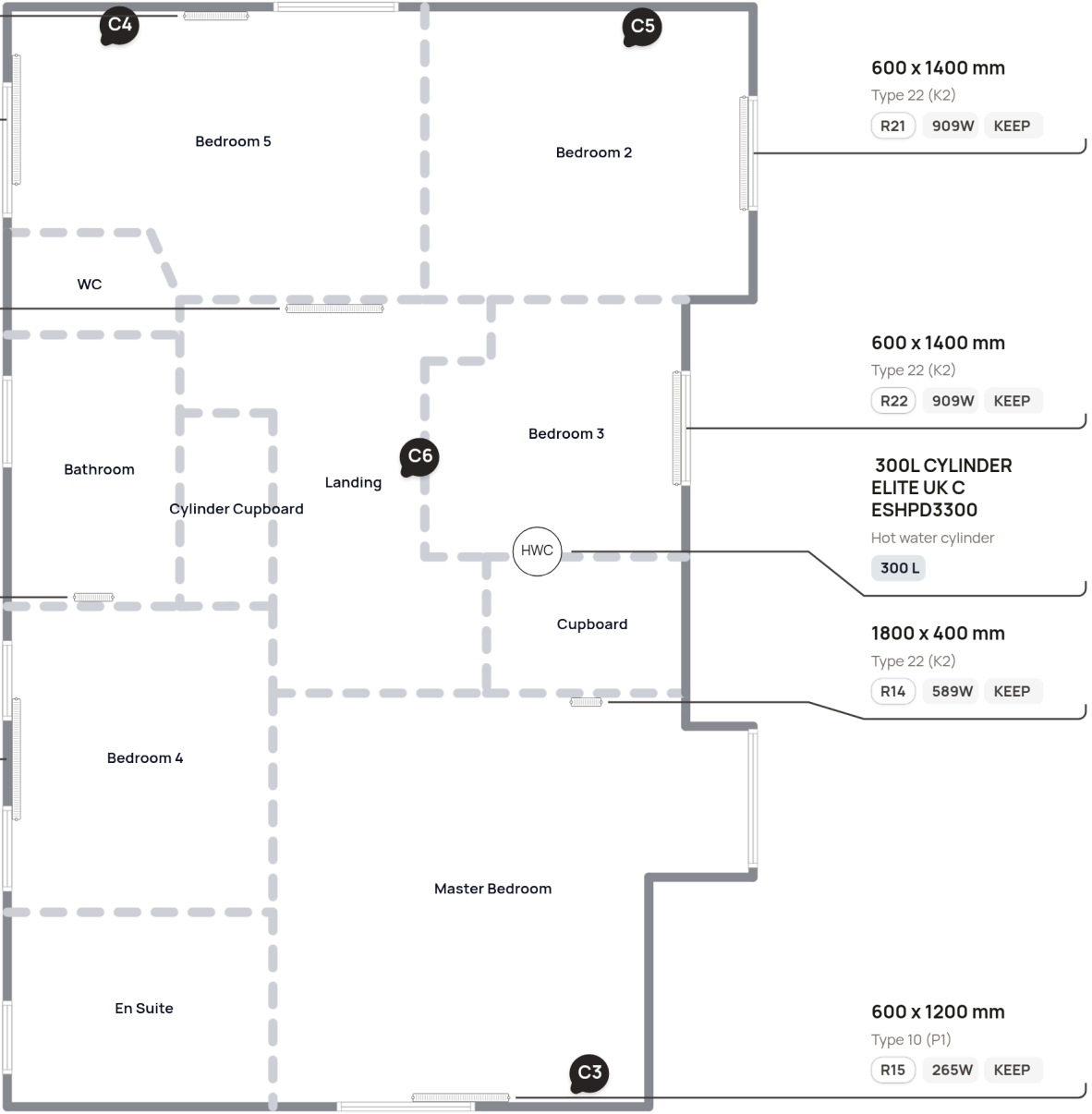
Type 22 (K2)

R14 589W **KEEP**

600 x 1200 mm

Type 10 (P1)

R15 265W **KEEP**



LEGEND



Keep

ID	Comment	Photos
	AC Unit 1/2	
	AC Unit 1/4	
	AC unit 2/2	
	AC Unit 2/4	
	AC Unit 3/4	
	AC Unit 4/4	

Schedule, Emitters

6 Mayfields, Sindlesham, Wokingham, RG41 5BY



Emitters

Floor / Room	Room temp.	Room demand	Emitter no.	Emitter type	Emitter size	DT50 output	MWT*	Design output	Emitter status	Flow rate
Ground floor										
Games Room	21 °C	193% of 751 W	R1	Type 22 (K2)	1800 x 600 mm	2,376 W	42.5 °C	742 W	KEEP	1.1 L/min
			R2	VITA PLAN VERTICAL CONCEPT	1800 x 600 mm	2,214 W	42.5 °C	710 W	KEEP	1.1 L/min
Lounge	21 °C	124% of 846 W	R3	Type 22 (K2)	1600 x 600 mm	2,178 W	42.5 °C	681 W	KEEP	1.6 L/min
			R4	Type 11 (K1)	600 x 1200 mm	1,140 W	42.5 °C	365 W	KEEP	0.9 L/min
Prayer Room	21 °C	127% of 234 W	R5	Type 10 (P1)	600 x 1600 mm	931 W	42.5 °C	298 W	KEEP	0.7 L/min
Dining Room	21 °C	289% of 391 W	R6	Type 22 (K2)	600 x 1400 mm	2,446 W	42.5 °C	764 W	KEEP	0.8 L/min
			R7	Type 11 (K1)	600 x 1200 mm	1,140 W	42.5 °C	365 W	KEEP	0.4 L/min
Hallway	18 °C	100% of -5 W	R8	Type 10 (P1)	600 x 800 mm	466 W	42.5 °C	177 W	KEEP	–
WC	22 °C	132% of 106 W	R9	Straight towel rail	760 x 600 mm	439 W	42.5 °C	140 W	KEEP	0.3 L/min

* MWT – Mean water temperature

Schedule, Emitters (cont.)

6 Mayfields, Sindlesham, Wokingham, RG41 5BY



Emitters

Floor / Room	Room temp.	Room demand	Emitter no.	Emitter type	Emitter size	DT50 output	MWT*	Design output	Emitter status	Flow rate
Ground floor										
Kitchen	18 °C	749% of 389 W	UFH1	Solid (Screed) - Vinyl tiles, 2mm (0W/m²K)				2,913 W	KEEP	
Kitchen (Annex)	18 °C	143% of 413 W	R10	Type 22 (K2)	1800 x 400 mm	1,584 W	42.5 °C	589 W	KEEP	1.2 L/min
Lounge (Annex)	21 °C	192% of 369 W	R11	Type 22 (K2)	600 x 1300 mm	2,271 W	42.5 °C	710 W	KEEP	1.1 L/min
Bedroom (Annex)	18 °C	338% of 250 W	R12	Type 22 (K2)	600 x 1300 mm	2,271 W	42.5 °C	844 W	KEEP	0.7 L/min
Bathroom (Annex)	22 °C	60% of 132 W	R13	Straight towel rail	803 x 500 mm	236 W	42.5 °C	79 W	KEEP	0.2 L/min
				Accepted undersized emitter						
First floor										
Master Bedroom	18 °C	180% of 474 W	R14	Type 22 (K2)	1800 x 400 mm	1,584 W	42.5 °C	589 W	KEEP	0.9 L/min
			R15	Type 10 (P1)	600 x 1200 mm	698 W	42.5 °C	265 W	KEEP	0.4 L/min

* MWT — Mean water temperature

Schedule, Emitters (cont.)

6 Mayfields, Sindlesham, Wokingham, RG41 5BY



Emitters

Floor / Room	Room temp.	Room demand	Emitter no.	Emitter type	Emitter size	DT50 output	MWT*	Design output	Emitter status	Flow rate
First floor										
Bedroom 4	18 °C	635% of 211 W	R16	Type 33 (K3)	600 x 1500 mm	3,584 W	42.5 °C	1,342 W	KEEP	0.6 L/min
Landing	18 °C	235% of 113 W	R17	Type 10 (P1)	600 x 1200 mm	698 W	42.5 °C	265 W	KEEP	0.3 L/min
Bathroom	22 °C	204% of 261 W	R18	Type 22 (K2)	1600 x 500 mm	1,815 W	42.5 °C	532 W	KEEP	0.8 L/min
Bedroom 5	18 °C	334% of 398 W	R19	Type 22 (K2)	600 x 1600 mm	2,795 W	42.5 °C	1,039 W	KEEP	0.9 L/min
			R20	Type 11 (K1)	600 x 800 mm	760 W	42.5 °C	289 W	KEEP	0.3 L/min
Bedroom 2	18 °C	238% of 382 W	R21	Type 22 (K2)	600 x 1400 mm	2,446 W	42.5 °C	909 W	KEEP	1.1 L/min
Bedroom 3	18 °C	436% of 209 W	R22	Type 22 (K2)	600 x 1400 mm	2,446 W	42.5 °C	909 W	KEEP	0.6 L/min

* MWT – Mean water temperature

Schedule, Emitters (cont.)

6 Mayfields, Sindlesham, Wokingham, RG41 5BY



Underfloor heating

Floor / Room	Room temp.	Manifold	Emitter no.	UFH config	Pipe spacing	Pipe Ø	Floor covering	Heated area	MWT*	Output	Emitter status
Ground floor											
Kitchen	18 °C	M1	UFH1	Solid (Screed)	150 mm	16 mm	Vinyl tiles, 2mm – 0 W/m²K	20.8 m²	42.5 °C	2,913 W	KEEP

Manifolds

Manifold	Name / location	Rooms covered	No. of loops	Area covered	MWT*	Pressure drop
M1	Manifold 1	Kitchen	2	20.8 m²	42.5 °C	0.8 kPa

* MWT — Mean water temperature

LEGEND

 Manifold



2 m

GENERAL NOTES

No notes.

 Callout reference

DRAWING TITLE

Ground floor, Pipework

JOB NAME

6 Mayfields, Sindlesham,
Wokingham, RG41 5BY

DATE CREATED

20/07/2026

DRAWING ID

P.01

GENERAL NOTES

No notes.

 Callout reference

DRAWING TITLE

First floor, Pipework

JOB NAME

6 Mayfields, Sindlesham,
Wokingham, RG41 5BY

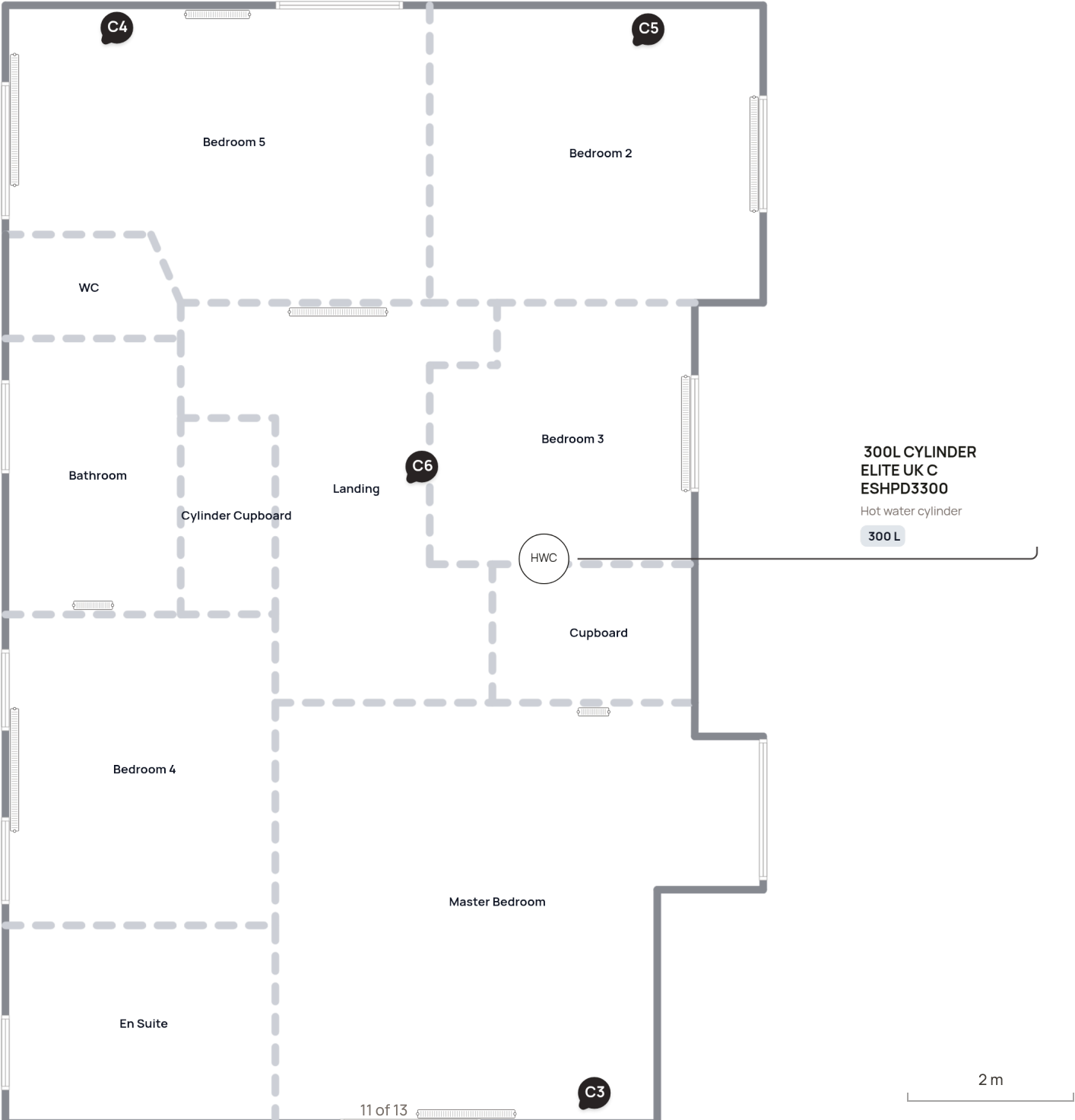
DATE CREATED

20/07/2026

DRAWING ID

P.02

Designed using **spruce** 



ID	Comment	Photos
	AC Unit 1/2	
	AC Unit 1/4	
	AC unit 2/2	
	AC Unit 2/4	
	AC Unit 3/4	
	AC Unit 4/4	

Schedule, Pipework

6 Mayfields, Sindlesham, Wokingham, RG41 5BY



No pipework on this drawing