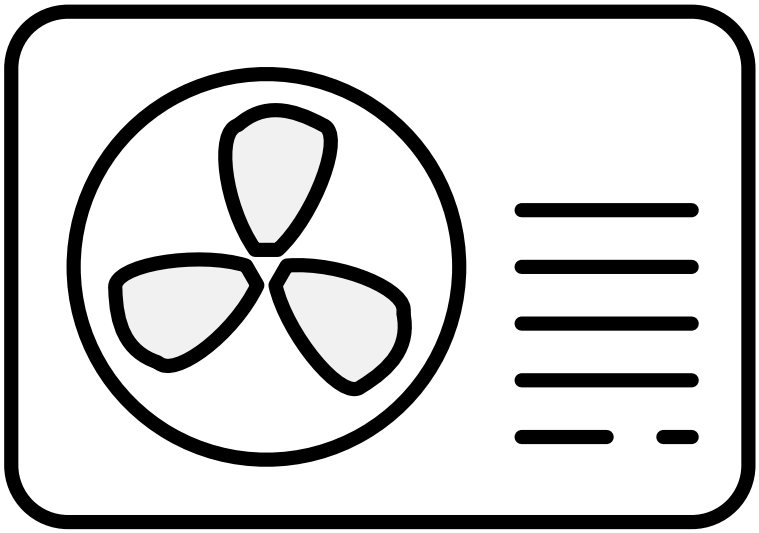

Heat Pump

Technical Report

[redacted] Jan 13 2025

[redacted]

[redacted]

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Inputs

Property Details

Year built	Pre 2000

Design Data

Outside Design Temp – ODT	-3°C
Degree Days (DD)	2254
Mean air temp – MAT	10°C
Altitude	5m

Building Requirements

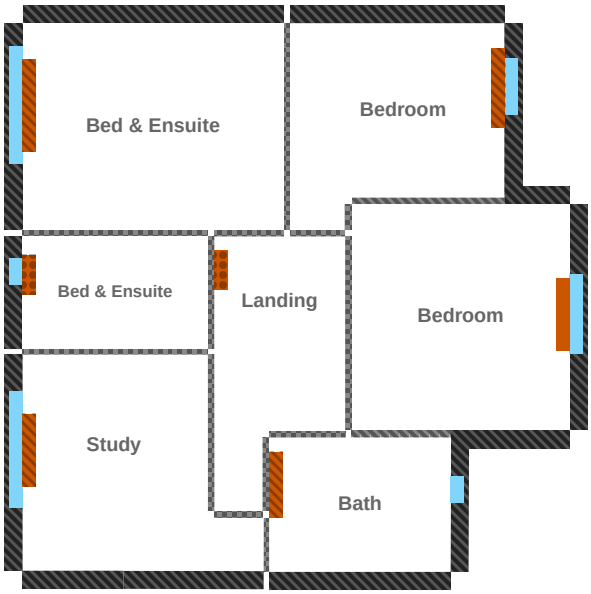
Space Heating load	6388W
Total area of building	120.01m²
Average Watts per metre square heat loss	53W/m²

Materials

The list of materials surveyed in the building. Radiators that will be removed are displayed with a lighter shade. Floors, intermediate floors, roofs, roof glazing and dormers are not shown in the drawings but are displayed in the material list.

Ground floor

First floor



Window

PVC Double Glazed
U-value: 2.8

Door

solid wood door (external)
U-value: 3

PVC-U door double glazed
U-value: 2.8

Radiator

P+ - two panels, one fins

K2 - two panels, two fins

K3 - three panels, three fins

K1 - one panel, one fins

External Wall

Brick 102mm, mineral wool slab in cavity 50mm,100mm standard aerated block (k=0.17), 12.5mm plasterboard on dabs
U-value: 0.43
Thickness: 275 mm

Internal Wall

Plasterboard 12.5mm, studding 75mm, plasterboard 12.5mm
U-value: 1.72
Thickness: 100 mm

Plaster 13mm, standard aerated block 100mm, plaster 13mm
U-value: 1.66
Thickness: 126 mm

Building Regs 1999
U-value: 1.92
Thickness: 100 mm

Floor

Solid floor with 0mm of insulation

Building Regs 1999
U-value: 0.45
Thickness: 200 mm

Intermediate Floor

Intermediate floors, boarding 19mm, airspace 100mm insulation between joists, 9.5mm plasterboard
U-value: (up) 0.32, (down) 0.31

Intermediate floors, boarding 19mm, airspace between joists, 9.5mm plasterboard
U-value: (up) 1.73, (down) 1.41

Roof

Pitched roof - Slates or tiles, sarking felt, ventilated air space, 300mm insulation between rafters, 9.5 mm plasterboard
U-value: 0.12

Pitched roof - Slates or tiles, sarking felt, ventilated air space, 200mm insulation between rafters, 9.5 mm plasterboard
U-value: 0.18

Heating check

We have checked that every room in your property will still be warm enough after the installation of the heat pump.

We've surveyed every room to work out the total expected heat loss through the ventilation, roof, walls, floors, windows and doors, at the specified room temperature. We've then compared this with the heat that the heat emitters will produce to ensure that every room will be warm enough. Radiators that will be removed are displayed with a lighter shade.

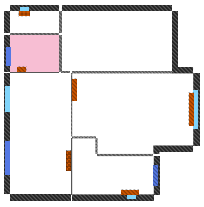
The output power of each radiator is calculated using:

The proposed flow temperature	**55°C**
The dT	**8°C**
The mean water temperature	**51°C**

Ground floor

Utility

Area: 3.67 m² Heat loss: 104 W/m² Design Temp: 18°C Air changes: 3/hr



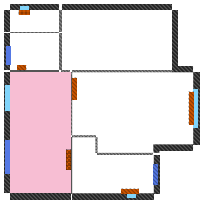
✓ Sufficient heating 548 W / 381 W

K2 As Surveyed

W400 x H900 mm 548 W

Kitchen

Area: 15.02 m² Heat loss: 43 W/m² Design Temp: 18°C Air changes: 2/hr



✓ Sufficient heating 1396 W / 641 W

K3 As Surveyed

W900 x H700 mm 1396 W

Assumptions

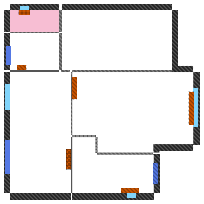
We have assumed an outside design temp of **-3.0**°C. This is based on tables of typical minimum winter temperatures in the UK.

We have used different design temperatures for different types of room. Bathrooms are typically kept warmer than living spaces such as lounges, kitchens and bedrooms for example, while utility spaces can be kept at a lower temperature. Kitchens and bathrooms also have more ventilation than other rooms, so we have allow for more heat loss through air exchange to these rooms.

Most heat loss from a property is through the building fabric however. We have provided a floorplan with a list of the materials we have used for the model along with a measure (U-value) of their insulating properties.

Cloak/WC

Area: 2.14 m² Heat loss: 94 W/m² Design Temp: 18°C Air changes: 2/hr



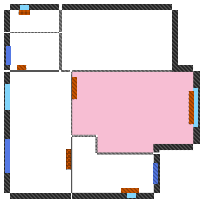
Sufficient heating 330 W / 200 W

P+ As Surveyed

W500 x H500 mm 330 W

Lounge

Area: 18.52 m² Heat loss: 100 W/m² Design Temp: 21°C Air changes: 3/hr



Sufficient heating 1913 W / 1857 W

K2 As Surveyed

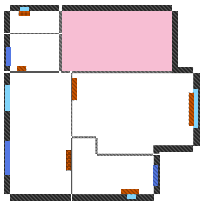
W1000 x H600 mm 875 W

K2 As Surveyed

W1500 x H450 mm 1038 W

Garage

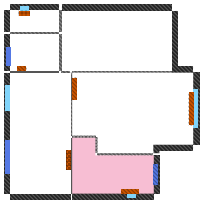
Area: 13.55 m² Heat loss: -18 W/m² Design Temp: 5°C Air changes: 3/hr



Sufficient heating 0 W / -246 W

Hall

Area: 7.30 m² Heat loss: 58 W/m² Design Temp: 18°C Air changes: 2/hr



Sufficient heating 796 W / 420 W

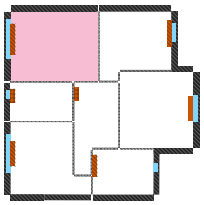
K2 As Surveyed

W800 x H600 mm 796 W

First floor

Bed & Ensuite

Area: 12.39 m² Heat loss: 71 W/m² Design Temp: 21°C Air changes: 2/hr



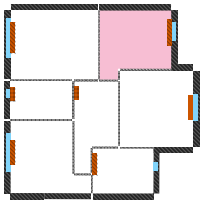
Sufficient heating 969 W / 874 W

K2 As Surveyed

W1400 x H450 mm 969 W

Bedroom

Area: 9.01 m² Heat loss: 36 W/m² Design Temp: 18°C Air changes: 1/hr



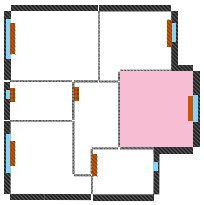
Sufficient heating 944 W / 324 W

K2 As Surveyed

W1200 x H450 mm 944 W

Bedroom

Area: 11.33 m² Heat loss: 29 W/m² Design Temp: 18°C Air changes: 1/hr



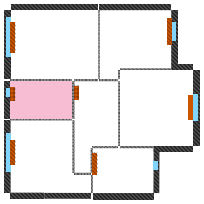
Sufficient heating 488 W / 323 W

K1 As Surveyed

W1100 x H450 mm 488 W

Bed & Ensuite

Area: 4.81 m² Heat loss: 61 W/m² Design Temp: 21°C Air changes: 2/hr



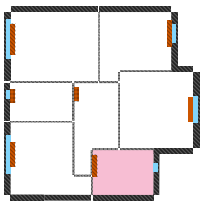
✓ Sufficient heating 406 W / 295 W

P+ As Surveyed

W600 x H600 mm 406 W

Bath

Area: 5.62 m² Heat loss: 103 W/m² Design Temp: 22°C Air changes: 3/hr



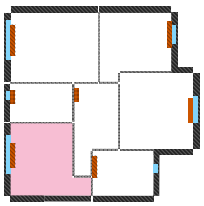
✓ Sufficient heating 836 W / 579 W

K2 As Surveyed

W1000 x H600 mm 836 W

Study

Area: 9.90 m² Heat loss: 66 W/m² Design Temp: 21°C Air changes: 1.5/hr



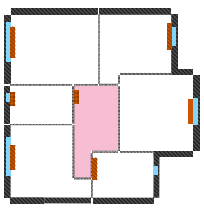
✓ Sufficient heating 761 W / 657 W

K2 As Surveyed

W1100 x H450 mm 761 W

Landing

Area: 6.75 m² Heat loss: 12 W/m² Design Temp: 18°C Air changes: 2/hr



✓ Sufficient heating 462 W / 83 W

P+ As Surveyed

W600 x H600 mm 462 W

Why do I need new radiators?

Heat pumps work more efficiently at low flow temperatures - but at low temperatures small radiators may not have enough surface area to adequately heat a room.

With new, larger radiators you will use less energy to heat your property than if you used existing smaller radiators but had to run your heat pump at a higher temperature.

Appendix

Heat Pump Check

Your heat pump: Vaillant aroTHERM plus 7

Total heat loss	**6389 W**
Area of building	**120.01 m^2**
Average heat loss	**53 W/m^2**
Output power of **Vaillant aroTHERM plus 7** at the ODT and proposed flow temperature	**7400 W**

Heat pump meets demand

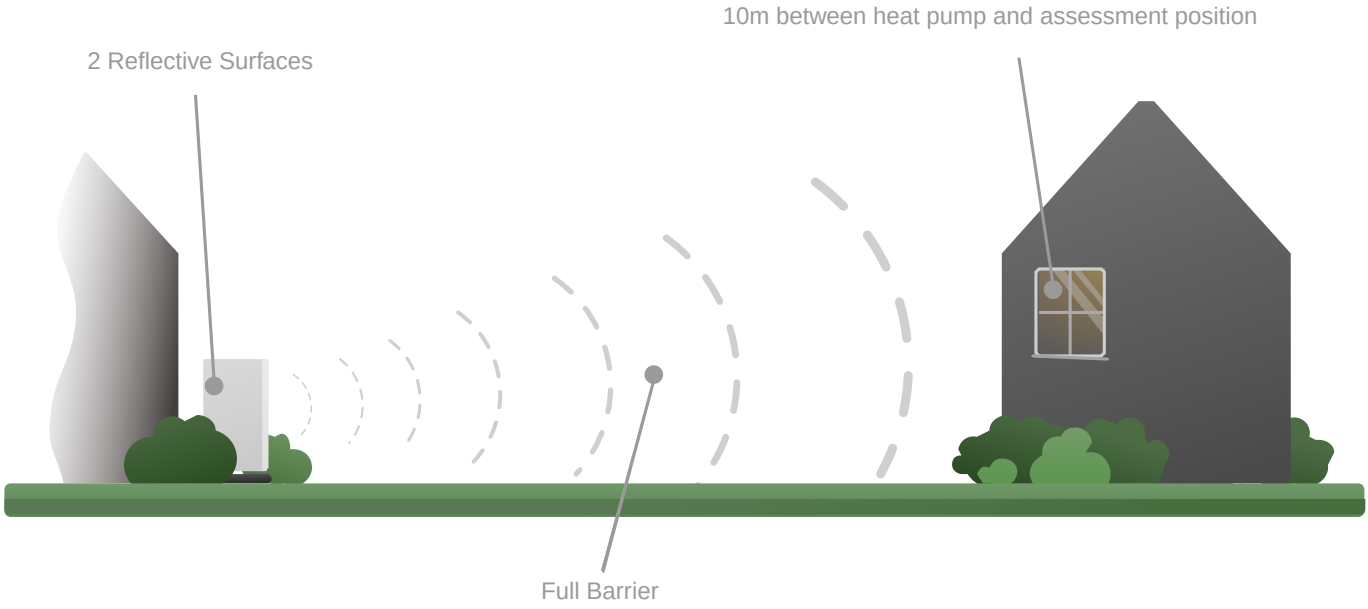
At the ODT -3 and proposed flow temperature 55°C, the total heat loss is less than the output power of the heat pump.

Sound check

Before your heat pump can be installed, we need to check that the noise it creates will not disturb your neighbours. Modern heat pumps are quiet, but are best not sited very close to doors or windows that may be open.

The sound check assesses how much sound from the heat pump will be transmitted to neighbouring properties. If the maximum sound level is less than 42dB then the installation can proceed without a planning application under the 'permitted development' rules.

Full details on the method used can be found in the MCS020 document on the MCS website.



MCS020 Sound Level Calculation

1. Sound power level	**55.0 dB**
2. Sound pressure level	**Q4 (two reflective surfaces)**
3. Distance from heat pump to assessment position	**10 m**
4. dB Distance reduction	**-25 dB**
5. Barriers between heat pump & assessment position	**Yes**
6. Sound pressure level @ assessment position	**20 dB**
7. Background noise level	**40 dB**
8. Difference between 6 & 7	**20 dB**
9. Decibel Correction	**0.1 dB**
10. Final Result	**41 dB**

Sound requirements met

The maximum sound pressure at the assessment position is expected to be 41dB. This is below the permitted limit of 42dB.

Hot Water Calculations

Heat pumps are able to produce heat energy for both your heating system and your domestic hot water (DHW). However, they are not capable of producing instantaneous DHW for your taps, baths and showers and so a thermal store is required.

MCS guidance states that this thermal store should be a minimum of 45ℓ per occupant. Based on this, we have selected a 250ℓ DHW store for your property and the details of the storage temps, reheat times and energy consumption are given below.

DHW calculations are based on the parameters given below. Actual energy consumption will vary with usage habits, variation in system settings and outdoor conditions.

DHW Storage Details	
Make	**UK Cylinders**
Model	**FCHPD3250**
Nominal Capacity	**250ℓ**
Electric Immersion	**3 kW**
Dimension (L × W × H)	**545 × 545 × 1701 mm**
DHW System Details	
Hot water storage temperature	**50°C**
Supply water temperature	**10°C**
Flow temperature whilst providing hot water	**55°C**
Pipework efficiency	**80%**
Heat pump capacity output @ 55°C	**7.4 kW**
Number of occupants	**3**
Water consumption per person per day	**50ℓ**
DHW Calculations	
Hot water storage reheat time	**118 min**
DHW Energy demand excluding Legionella	**2555 kWh/yr**
DHW Energy demand including Legionella	**2711 kWh/yr**
Mixed water volume @40°C	**333 ℓ**
Legionella Details	
Legionella purge	**yes**
Legionella purge frequency	**weekly**
Legionella purge hours (weekly)	**1 hr**
Legionella heat source	**immersion**
Legionella purge energy demand	**156 kWh/yr**

Legionella

Legionella is an aquatic pathogen that thrives in warm stagnant water, and can cause diseases such as Legionnaires' when inhaled. In order for Legionella to multiply and grow to dangerous levels, it requires stagnant water and a temperature of between 20°C and 40°C. Eliminating either of these conditions will prevent it from growing and using most of your DHW capacity each day will likely prevent growth to dangerous levels. If you do store water at optimum growth conditions, then an anti-Legionella cycle (Legionella purge) will kill off any bacteria that might have formed by sterilising the water at a high temperature (70°C = instantly kills, 65°C = 100% in 2 mins, 60°C =100% in 30 mins).