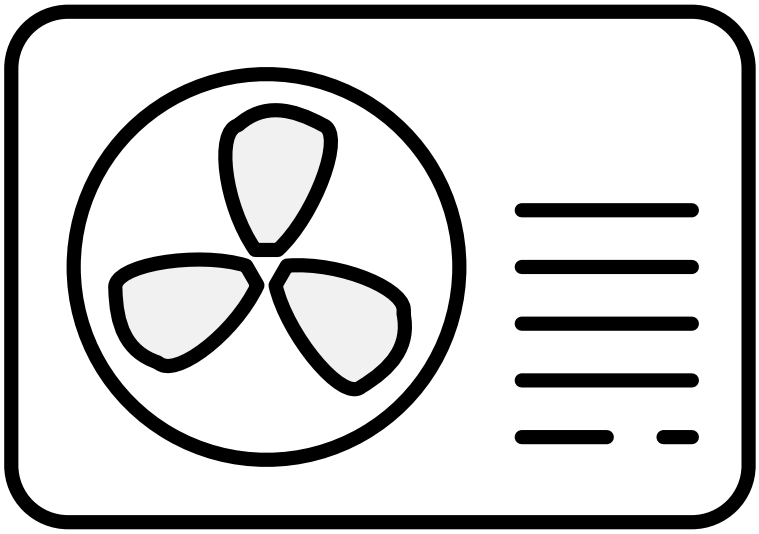


Heat Pump

Technical Report

E83248 - Beech Croft

Valerie Lester

Beech Croft

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Inputs

Property Details

Year built	Pre 2000

Design Data

Outside Design Temp – ODT	-3.5°C
Degree Days (DD)	2161
Mean air temp – MAT	9.9°C
Altitude	78m

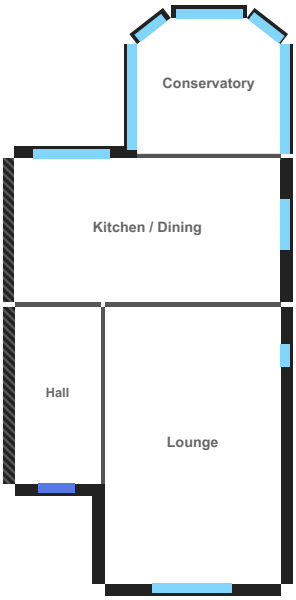
Building Requirements

Space Heating load	5987W
Total area of building	97.89m²
Average Watts per metre square heat loss	61W/m²

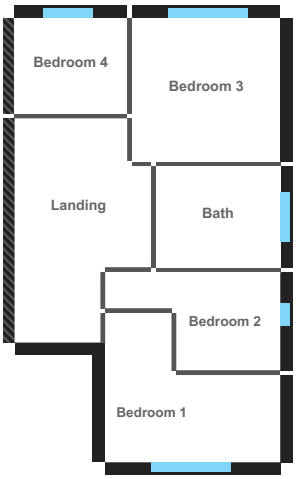
Materials

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, low-E glass
U-value: 2.3

Door

PVC-U door double glazed
U-value: 2.8

Radiator

K2 - two panels, two fins

K1 - one panel, one fins

P+ - two panels, one fins

External Wall

Brick 102mm, 50mm mineral slab, brick 102mm, 13mm plaster
U-value: 0.56
Thickness: 267 mm

Party wall
U-value: 0.5
Thickness: 250 mm

Internal Wall

Plaster 13mm, brick 102.5mm, plaster 13mm
U-value: 1.76
Thickness: 128 mm

Floor

Solid floor with 0mm of insulation

Intermediate Floor

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 joists, 9.5 mm plasterboard

U-value: 0.12

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.

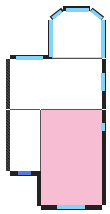
The output power of each radiator is calculated using:

The proposed flow temperature	**55°C**
The dT	**5°C**
The mean water temperature	**52.5°C**

Ground floor

Lounge

Area: 21.29 m² Heat loss: 64 W/m² Design Temp: 21°C Air changes: 1.5/hr



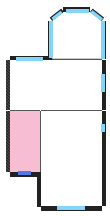
✓ Sufficient heating 1877 W / 1368 W

K2 New

W2000 x H600 mm 1877 W

Hall

Area: 6.66 m² Heat loss: 52 W/m² Design Temp: 18°C Air changes: 2/hr



✓ Sufficient heating 608 W / 346 W

K1 New

W1000 x H600 mm 608 W

Assumptions

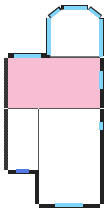
We have assumed an outside design temp of **-3.5**°C. This is based on tables of typical minimum winter temperatures in the UK.

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.

Kitchen / Dining

Area: 16.77 m² Heat loss: 77 W/m² Design Temp: 21°C Air changes: 2/hr

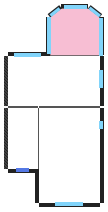


Overridden: Adjacent Room Warm Air Drift	951 W / 1291 W

K2		New
W900 x H700 mm		951 W

Conservatory

Area: 8.16 m² Heat loss: 126 W/m² Design Temp: 18°C Air changes: 1.5/hr



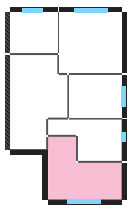
Overridden: Adjacent Room Warm Air Drift	956 W / 1026 W

K2		New
W800 x H700 mm		956 W

First floor

Bedroom 1

Area: 8.52 m² Heat loss: 47 W/m² Design Temp: 18°C Air changes: 1/hr

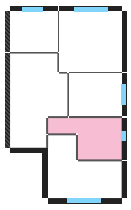


Sufficient heating	426 W / 403 W

K1		New
W700 x H600 mm		426 W

Bedroom 2

Area: 5.62 m² Heat loss: 19 W/m² Design Temp: 18°C Air changes: 1/hr



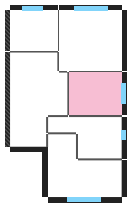
Sufficient heating 243 W / 106 W

K1 New

W400 x H600 mm 243 W

Bath

Area: 5.53 m² Heat loss: 99 W/m² Design Temp: 22°C Air changes: 3/hr



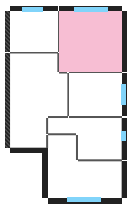
Sufficient heating 554 W / 548 W

P+ New

W700 x H700 mm 554 W

Bedroom 3

Area: 9.33 m² Heat loss: 33 W/m² Design Temp: 18°C Air changes: 1/hr



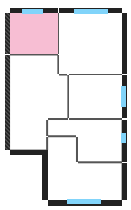
Sufficient heating 365 W / 309 W

K1 New

W600 x H600 mm 365 W

Bedroom 4

Area: 4.74 m² Heat loss: 38 W/m² Design Temp: 18°C Air changes: 1/hr



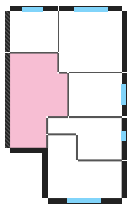
Sufficient heating 243 W / 182 W

K1 New

W400 x H600 mm 243 W

Landing

Area: 11.27 m² Heat loss: 36 W/m² Design Temp: 18°C Air changes: 2/hr



✓ Sufficient heating 426 W / 408 W

K1 New

W700 x H600 mm 426 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: Mitsubishi Ecodan 6kW

Total heat loss	**5988 W**
Area of building	**97.89 m^2**
Average heat loss	**61 W/m^2**
Output power of **Mitsubishi Ecodan 6kW** at the ODT and proposed flow temperature	**6000 W**



Heat pump meets demand

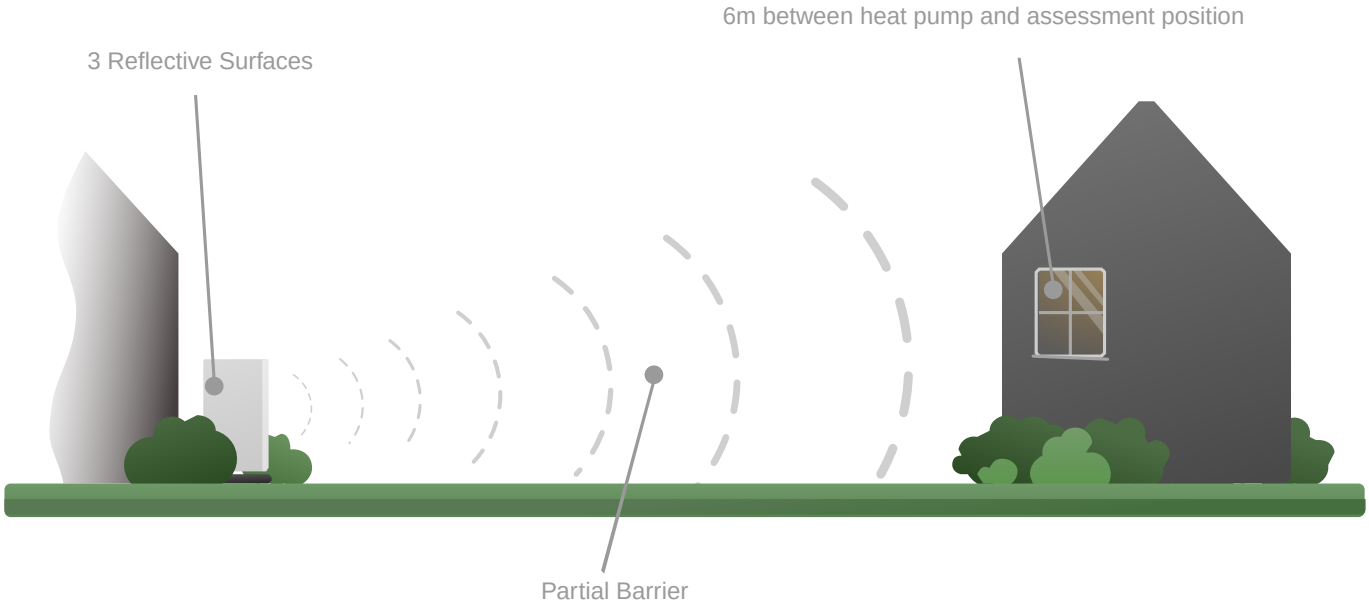
At the ODT -3.5 and proposed flow temperature 55°C, the total heat loss is less than the output power of the heat pump.

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	**58.0 dB**
2. Sound pressure level	**Q8 (three reflective surfaces) dB**
3. Distance from heat pump to assessment position	**6 m**
4. dB Distance reduction	**-17 dB**
5. Barriers between heat pump & assessment position	**Partial**
6. Sound pressure level @ assessment position	**36 dB**
7. Background noise level	**40 dB**
8. Difference between 6 & 7	**4 dB**
9. Decibel Correction	**1.5 dB**
10. Final Result	**42 dB**

Sound requirements met

The maximum sound pressure at the assessment position is expected to be 42dB. 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.

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	
Model	
Nominal Capacity	**250ℓ**
Electric Immersion	**3 kW**
Dimension (L × W × H)	**700 × 590 × 2145 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	**6 kW**
Number of occupants	**5**
Water consumption per person per day	**50ℓ**
DHW Calculations	
Hot water storage reheat time	**146 min**
DHW Energy demand excluding Legionella	**4258 kWh/yr**
DHW Energy demand including Legionella	**4410 kWh/yr**
Mixed water volume @40°C	**333 ℓ**
Legionella Details	
Legionella purge	**yes**
Legionella purge frequency	**weekly**
Legionella heat source	**immersion**
Legionella purge energy demand	**152 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).