Heat Loss Report

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Appendix A

Summary of Results

When the external temperature is -5.28°C
The total heat source required to heat the building must provide an output of 7.42 kW

Heating Type: Air Source Heat Pump

Manufacturer: Vaillant Group UK Ltd

Model: aroTHERM Plus 10kW VWL 105/6 A 230V S2

Certificate Number: KIWA 00016/022 HP

Output at designed external temperature: 9.4 kW

Maximum designed flow temperature: 45°C

ASHP=Air Source Heat Pump

Worst Performing Room

Room name: Bathroom 1

Floor Area: 5.33 m²

Power demand: 553.5 watts

Specific room heat loss: 103.81 W/m²

Emitter type: Standard Radiators

Seasonal Coefficient of Performance (SCOP): 4.13

Temperature Star Rating: ★★★★

Calculated Energy using Degree Day Data: The energy calculation method is worst case scenario, therefore assuming all rooms to be heated to their designed temperatures throughout the heating season. Of course most people don't use all the rooms and don't have the heating on within all rooms throughout a year at maximum. As a result, the calculated energy figure can be overestimated, therefore running costs may be higher with this calculation than actual.

Appendix B
Room Features

Number of rooms 8 and total floor area 89.32 m²
Location (Degree Day): Jedburgh, Roxburghshire, Jedburgh
Ground Temperature 9 °C
Outside Temperature -5.28 °C
Degree Day Data 2483
Is property > 2006? NO
If property has thermal bridging? NO
Does the building have MVHR? NO

Room Names	Designed Temperature	Fireplace	Throat restriction	Year room was built	Air Changes Per Hour	Exposed Location	Intermitted Heating	Vaulted Ceiling?	Vaulted Ceiling Type	Room Below	Room Above	Emitter Type
Living Room	21	NO	NO	1900	1.5	NO	NO	NO	-	None	None	Standard Radiators
Bedroom 1	18	NO	NO	1900	1	NO	NO	NO	-	None	None	Standard Radiators
Bedroom 2	18	NO	NO	1900	1	NO	NO	NO	-	None	None	Standard Radiators
Hall	18	NO	NO	1900	1.5	NO	NO	NO	-	None	None	Standard Radiators
Bedroom 3	18	NO	NO	1900	1	NO	NO	NO	-	None	None	Standard Radiators
Bathroom 1	22	NO	NO	1900	2	NO	NO	NO	-	None	None	Standard Radiators
Kitchen	18	NO	NO	1900	2	NO	NO	NO	-	None	None	Standard Radiators
Kitchen 2	18	NO	NO	1900	2	NO	NO	NO	-	None	None	Standard Radiators

Appendix C

Room Dimensions

Room Names	Floor Areas m²	Room Height m	External wall(Type A) m	External wall(Type B) m	Window (Type A) m²	Window (Type B) m²	Internal Wall m	Party wall m	External Door Area m²	Roof Glazing Area m²	Lowest Parallel room temp	High ceiling % increase
Living Room	26.06	2.40	10.34	0	2.30	0	0	0	0	0	18 °C	0 %
Bedroom 1	16.28	2.40	3.70	0	0.98	0	0	0	0	0	18 °C	0 %
Bedroom 2	8.74	2.40	6.37	0	0.55	0	0	0	0	0	18 °C	0 %
Hall	6.32	2.20	1.74	0	0.38	0	0	0	1.71	0	18 °C	0 %
Bedroom 3	7.05	2.20	5.32	0	0.88	0	0	0	0	0	18 °C	0 %
Bathroom 1	5.33	2.20	2.48	0	0.41	0	0	0	0	0	18 °C	0 %
Kitchen	16.01	2.20	8.07	0	1.11	0	0	0	2.14	0	18 °C	0 %
Kitchen 2	3.53	2.20	1.37	0	0	0	0	0	0	0	18 °C	0 %

Appendix E

External, Internal and Party Walls

Room Names	External Wall (A)	External Wall (B)	Internal Wall	Party Wall
Living Room	Solid Stone 610mm 24" (1.68)	-	-	-
Bedroom 1	Solid Stone 610mm 24" (1.68)	-	-	-
Bedroom 2	Solid Stone 610mm 24" (1.68)	-	-	-
Hall	Render, Brick 102mm, Brick 102mm, Plaster (1.25)	-	-	-
Bedroom 3	Render, Brick 102mm, Brick 102mm, Plaster (1.25)	-	-	-
Bathroom 1	Render, Brick 102mm, Brick 102mm, Plaster (1.25)	-	-	-
Kitchen	Render, Brick 102mm, Brick 102mm, Plaster (1.25)	-	-	-
Kitchen 2	Render, Brick 102mm, Brick 102mm, Plaster (1.25)	-	-	-

Appendix F

Windows and Doors

Room Names	Window Type (A)	Window Type (B)	Roof Glazing	Door
Living Room	uvalue (1.2)	-	-	Building Regulations 2021 for new dwelling, Doors including glazed (1.6)
Bedroom 1	uvalue (1.2)	-	-	Building Regulations 2021 for new dwelling, Doors including glazed (1.6)
Bedroom 2	uvalue (1.2)	-	-	Building Regulations 2021 for new dwelling, Doors including glazed (1.6)
Hall	uvalue (1.2)	-	-	Solid Wood Door (3)
Bedroom 3	uvalue (1.2)	-	-	Building Regulations 2021 for new dwelling, Doors including glazed (1.6)
Bathroom 1	uvalue (1.2)	-	-	Building Regulations 2021 for new dwelling, Doors including glazed (1.6)
Kitchen	uvalue (1.2)	-	-	Building Regulations 2021 for new dwelling, Doors including glazed (1.6)
Kitchen 2	uvalue (1.2)	-	-	Building Regulations 2021 for new dwelling, Doors including glazed (1.6)

Appendix G
Floors, Ceilings and Roof

Room Names	Floor	Roof or Ceiling
Living Room	Ground Floor No Insulation (1.15)	Pitched roof with tiles, sarking felt, 300mm Insulation between joists (0.12)
Bedroom 1	Ground Floor No Insulation (1.15)	Pitched roof with tiles, sarking felt, 300mm Insulation between joists (0.12)
Bedroom 2	Ground Floor No Insulation (1.15)	Pitched roof with tiles, sarking felt, 300mm Insulation between joists (0.12)
Hall	Ground Floor No Insulation (1.15)	Flat roof, Chipping, 3 layer of felt, boarding, air space, insulation 50mm, plasterboard (0.53)
Bedroom 3	Ground Floor No Insulation (1.15)	Flat roof, Chipping, 3 layer of felt, boarding, air space, insulation 50mm, plasterboard (0.53)
Bathroom 1	Ground Floor No Insulation (1.15)	Flat roof, Chipping, 3 layer of felt, boarding, air space, insulation 50mm, plasterboard (0.53)
Kitchen	Ground Floor No Insulation (1.15)	Flat roof, Chipping, 3 layer of felt, boarding, air space, insulation 50mm, plasterboard (0.53)
Kitchen 2	Ground Floor No Insulation (1.15)	Flat roof, Chipping, 3 layer of felt, boarding, air space, insulation 50mm, plasterboard (0.53)

Appendix H

Review of Heat Loss Part 1

Room Names	W/m²	Floor (watts)	External wall Type A (watts)	External wall Type B (watts)	Window Type A (watts)	Window Type B (watts)	Internal Wall (watts)	Party Wall (watts)	External Door (watts)	Roof Glazing (watts)	Roof or Ceiling (watts)
Living Room	89.10	359.63	994.09	0.00	72.53	0.00	0.00	0.00	0.00	0.00	82.18
Bedroom 1	52.24	168.50	309.00	0.00	27.36	0.00	0.00	0.00	0.00	0.00	45.48
Bedroom 2	99.30	90.46	576.57	0.00	15.25	0.00	0.00	0.00	0.00	0.00	24.42
Hall	76.62	65.41	50.49	0.00	10.69	0.00	0.00	0.00	119.43	0.00	77.98
Bedroom 3	87.78	72.93	314.98	0.00	24.58	0.00	0.00	0.00	0.00	0.00	86.94
Bathroom 1	103.81	79.71	172.14	0.00	13.36	0.00	0.00	0.00	0.00	0.00	77.09
Kitchen	88.25	165.66	422.00	0.00	30.94	0.00	0.00	0.00	79.90	0.00	197.48
Kitchen 2		36.58	87.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.61

Review of Heat Loss Part 2

Room Names	High Ceiling Increase (watts)	Amount of Air Heated per hour (m³/ hour)	Ventilation (watts)	Exposed Location (watts)	Intermitted Heating (watts)	Thermal Bridges (watts)	Total Watts	Total kWh
Living Room	0.00	93.82	813.61	0.00	0.00	0.00	2322.04	6235.85
Bedroom 1	0.00	39.07	300.17	0.00	0.00	0.00	850.50	2861.47
Bedroom 2	0.00	20.98	161.15	0.00	0.00	0.00	867.84	2588.89
Hall	0.00	20.86	160.22	0.00	0.00	0.00	484.23	1632.57
Bedroom 3	0.00	15.50	119.10	0.00	0.00	0.00	618.54	1879.56
Bathroom 1	0.00	23.46	211.21	0.00	0.00	0.00	553.50	1400.39
Kitchen	0.00	70.42	541.03	0.00	0.00	0.00	1724.38	4511.05
Kitchen 2	0.00	15.55	119.48	0.00	0.00	0.00		884.22

Appendix I

Summary of U values (W/m²K) Part 1

Room Names	Floor	External Wall Type A	External Wall Type B	Window Type A	Window Type B	Internal Wall	Party Wall	External Door
Living Room	1.15	1.68	0	1.20	0	0	0	1.60
Bedroom 1	1.15	1.68	0	1.20	0	0	0	1.60
Bedroom 2	1.15	1.68	0	1.20	0	0	0	1.60
Hall	1.15	1.25	0	1.20	0	0	0	3.00
Bedroom 3	1.15	1.25	0	1.20	0	0	0	1.60
Bathroom 1	1.15	1.25	0	1.20	0	0	0	1.60
Kitchen	1.15	1.25	0	1.20	0	0	0	1.60
Kitchen 2	1.15	1.25	0	1.20	0	0	0	1.60

Summary of U values (W/m²K) Part 2

Room Names	Roof Glazing	Roof or Ceiling	Exposed Location	Intermitted Heating	Thermal Bridges	Room Temp Below (If none then average Ground temp)	Room Temp Above (through Ceiling or Roof)
Living Room	0	0.12	0	0	0	9	-5.28
Bedroom 1	0	0.12	0	0	0	9	-5.28
Bedroom 2	0	0.12	0	0	0	9	-5.28
Hall	0	0.53	0	0	0	9	-5.28
Bedroom 3	0	0.53	0	0	0	9	-5.28
Bathroom 1	0	0.53	0	0	0	9	-5.28
Kitchen	0	0.53	0	0	0	9	-5.28
Kitchen 2	0	0.53	0	0	0	9	-5.28

Appendix K

Emitters and Performance

Room Names	Type of Emitter	Current Emitter watts (70°C)	Current Rad Oversize %	Flow Temperature °C	W/m²	Room Heat Loss watts	Oversize Factor based on heat pump flow temp	MCS Heat emitter guide watts1	Underfloor Heating Details			Likely SCOP	Star Rating
									Floor Type	Floor Surface	Max Pipe Spacing	ASHP	
Living Room	Standard Radiators	0.00	0.00	45	89.10	2322.04	3.1	7198.34	-		N/A	4.13	★★★★
Bedroom 1	Standard Radiators	0.00	0.00	45	52.24	850.50	3.1	2636.56	-		N/A	4.13	★★★★
Bedroom 2	Standard Radiators	0.00	0.00	45	99.30	867.84	3.1	2690.30	-		N/A	4.13	★★★★
Hall	Standard Radiators	0.00	0.00	45	76.62	484.23	3.1	1501.11	-		N/A	4.13	★★★★
Bedroom 3	Standard Radiators	0.00	0.00	45	87.78	618.54	3.1	1917.47	-		N/A	4.13	★★★★
Bathroom 1	Standard Radiators	0.00	0.00	45	103.81	553.50	3.1	1715.86	-		N/A	4.13	★★★★
Kitchen	Standard Radiators	0.00	0.00	45	88.25	1724.38	3.1	5345.58	-	0	N/A	4.13	★★★★
Kitchen 2	Standard Radiators			45					-	0	N/A	4.13	★★★★

Appendix P

Air Source Heat Pump Summary

SPACE HEATING

101	Demand:	21,994 kWh/yr
102	Heat supplied by HP, excluding auxiliary heaters:	21,994 kWh/yr
103	SCOP(2):	4.13
104	Electricity consumed by HP, excluding auxiliary heaters:	5,325 kWh/yr
105	Renewable heat supplied by HP:	16,669 kWh/yr
106	Remaining heat to be supplied by auxiliary heaters and other heat sources:	0 kWh/yr
107	Remaining heat, supplied by other heat sources:	0 kWh/yr
108	Remaining heat, supplied by auxiliary heaters:	0 kWh/yr
109	Electricity consumed by HP, including auxiliary heaters:	5,325 kWh/yr

WHERE OTHER HEAT SOURCES ARE USED

110	Fuel used:	N/A
111	Efficiency of other heat sources:	0%
112	Consumed by other heat sources:	0 kWh/yr

WATER HEATING

	No. of bedrooms:	0 Rooms
	No of occupants / bedroom:	0 Person/s
	HP flow temperature in DHW mode:	55°C
	Hot water / occupant:	0 Litres/day
	Final HP secondary HW temperature:	50°C
201	Demand:	0 kWh/yr
202	Heat supplied by HP, excluding immersion heater:	0 kWh/yr
203	SCOP(2):	3.58
204	Electricity consumed by HP, excluding immersion heater:	0 kWh/yr
205	Renewable heat supplied by HP:	0 kWh/yr
206	Remaining heat to be supplied by immersion heater and other heat sources:	0 kWh/yr
207	Remaining heat, supplied by other heat sources:	0 kWh/yr
208	Remaining heat, supplied by immersion heater:	0 kWh/yr
209	Electricity consumed by HP, including immersion heater:	0 kWh/yr

WHERE OTHER HEAT SOURCES ARE USED

210	Fuel used:	N/A
211	Efficiency of other heat sources:	0%
212	Consumed by other heat sources:	0 kWh/yr

PROPORTIONS, ENERGY CONSUMPTION, AND PERFORMANCE

301	Proportion of space heating and water heating demand provided by heat pump (excluding auxiliary):	100%
302	Renewable heat:	16,669 kWh/yr
303	Electricity consumed by HP (excluding auxiliary/ immersion heaters):	5,325 kWh/yr
	Electricity consumed by auxiliary/immersion heaters (supplied as part of HP):	0 kWh/yr
304	Fuel consumed by other heat sources:	0 kWh/yr
305	HP combined performance SCOP(4):	4.13
306		

RUNNING COST

401	Cost per unit of electricity for HP:	24 p/kWh
402	Cost per unit of fuel for other heat sources:	0 p/kWh
403	Cost of electricity for HP (including auxiliary/ immersion heaters):	£1,278.10
404	Cost of fuel for other heat sources:	£0

Disclaimer:
"The performance of Microgeneration heat pump systems is impossible to predict with certainty due to the variability of the climate and its subsequent effect on both heat supply and demand. This estimate is based upon the best available information but is given as guidance only and should not be considered as a guarantee."

Appendix P

Proposed Emitters

Legend

Current Radiators (if applicable):	
Proposed Emitters:	

Room Temperature °C	Room Names	Room Heat Loss	Radiator Type	Height (mm)	Length (mm)	Output at 50K MW-Air delta T	At 42.5 °C MWT Conversion Factors Below	Custom defined MWT
						70°C Watts	Conversion factor	42.5 °C Output Watts
21	Living Room	2322.04	K3	600	1600	3665.87	0.334	1223.73
			K3	600	1600	3665.87	0.334	1223.73
					Total Watts	**7331.74**		**2447.46**
18	Bedroom 1	850.50	K3	600	1000	2291.17	0.396	906.38
					Total Watts	**2291.17**		**906.38**
18	Bedroom 2	867.84	K3	600	1000	2291.17	0.396	906.38
					Total Watts	**2291.17**		**906.38**
18	Hall	484.23	K2	600	800	1328.85	0.396	525.69
					Total Watts	**1328.85**		**525.69**
18	Bedroom 3	618.54	K2	600	1000	1661.06	0.396	657.12
					Total Watts	**1661.06**		**657.12**
22	Bathroom 1	553.50	K3	600	800	1832.94	0.314	575.13
					Total Watts	**1832.94**		**575.13**
18	Kitchen	1437.00	K3	600	1200	2749.40	0.396	1087.66
			K3	600	700	1603.82	0.396	634.47
					Total Watts	**4353.22**		**1722.13**