

UNDERFLOOR HEATING · EN 1264

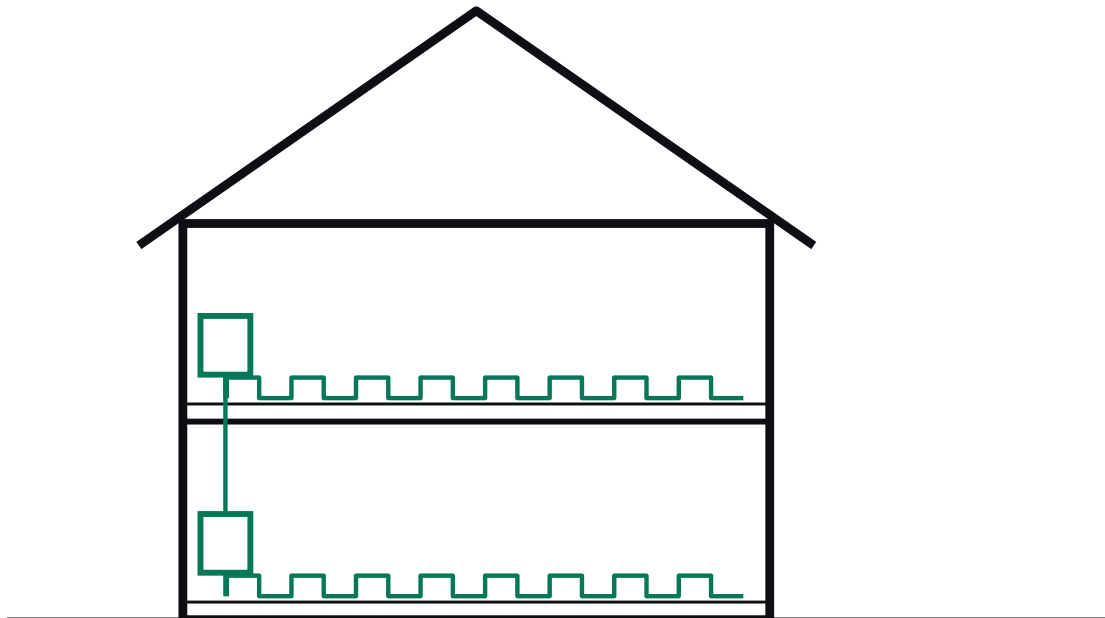
Underfloor heating design

116 m² · 10 rooms · 14 loops

FOR

Sarah Fox

14 Rowan Close, Leeds



Required supply
39 °C

The floor gives
6.32 kW

Pipe 16×2 mm
749 m

Power balance

39 °C

Required supply · design 41/36 °C [1]

4.37 kW

Heat loss of the rooms with loops

6.32 kW

The floor gives [2]

473 l/h

Building flow · 4.1 l/h per m²

Supply / return	41 / 36 °C	Pipe type	16×2 mm
Screed over the pipe	45 mm	Material over the pipe	Anhydrite screed, λ 1.2
Floor covering	Wood / laminate	Heated area	115.6 m ²
Heat in the water (manifolds)			5.46 kW
Building design heat loss - for sizing the heat pump			4.57 kW
Water content (loops and supply routes, without manifolds)			84.7 l

Every room [W]

Kitchen-diner		+203 W
WC		+62 W
Utility room		+189 W
Living room		+132 W
Guest room		+246 W
Children's room		+372 W
Main bedroom		+238 W
Bedroom		+145 W
Bathroom		+220 W
Study		+141 W

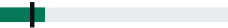
 the floor gives
  the room needs (heat loss)

[1] EN 1264-3:2021, 4.1.3.3 - the supply temperature the loops need at the design spread.

[2] EN 1264-2:2021 - the floor's heat output from its characteristic (pipes in the screed, type A).

Heating loops

Every loop once. The temperature, the covering at the resistance the design used [m²K/W] and the heat loss stand in the room's row.

Room / loop	LOOP				OPERATION		RESULT	
	A m ²	Spacing mm	Pipe m	Pattern	θF,m °C	l/min	Output W	Balance W
GROUND FLOOR								
Kitchen-diner 20 °C · Ceramic tiles 0.10 · heat loss 563 W					max 29		766	+203
0/1/A	7.5	200	46.0 11.9 + 34.1	Spiral	25.1	0.53	402	
0/1/B	6.8	200	36.7 6.0 + 30.7	Spiral	25.1	0.48	364	
WC 20 °C · Ceramic tiles 0.10 · heat loss 120 W					max 29		182	+62
0/2	3.3	175	20.5 4.4 + 16.1	Spiral	25.3	0.21	182	
Utility room 20 °C · Ceramic tiles 0.10 · heat loss 314 W					max 29		503	+189
0/3	8.1	125	63.6 8.5 + 55.1	Spiral	25.9	0.55	503	
Living room 20 °C · Wood / laminate 0.12 · heat loss 793 W					max 29		925	+132
0/6/A	7.6	175	46.0 5.2 + 40.8	Bifilar meander	25.1	0.65	407	
0/6/B	9.8	175	62.5 12.1 + 50.4	Spiral	25.0	0.83	518	
Guest room 20 °C · Wood / laminate 0.12 · heat loss 464 W					max 29		710	+246
0/7	13.2	175	76.0 4.5 + 71.5	Bifilar meander	25.1	0.82	710	
FIRST FLOOR								
Children's room 20 °C · Wood / laminate 0.12 · heat loss 409 W					max 29		781	+372
1/1	15.5	200	76.0 5.2 + 70.8	Bifilar meander	24.8	0.75	781	
Main bedroom 20 °C · Wood / laminate 0.12 · heat loss 553 W					max 29		791	+238
1/5/A	7.1	200	38.1 4.6 + 33.5	Bifilar meander	24.9	0.46	363	
1/5/B	8.2	200	50.8 10.3 + 40.5	Spiral	25.0	0.55	428	
Bedroom 20 °C · Wood / laminate 0.12 · heat loss 496 W					max 29		641	+145
1/6/A	5.2	200	31.8 6.7 + 25.1	Bifilar meander	24.9	0.38	267	
1/6/B	7.2	200	48.5 13.2 + 35.3	Spiral	25.0	0.53	373	
Bathroom 24 °C · Ceramic tiles 0.05 · heat loss 305 W					max 33		525	+220
1/2	8.1	100	74.1 4.7 + 69.4	Spiral	30.1	0.52	525	
Study 20 °C · Wood / laminate 0.12 · heat loss 105 W					max 29		495	+141
1/3	8.1	100	98.5 69.2	Spiral	25.8	0.65	495	

Total · 14 loops	115.6	749	7.89	6,319	+1,948
------------------	-------	-----	------	-------	--------

floor output | the room's need (heat loss)

| Loop pipe: the total, under it the run to the manifold + the coil in the room [m].

Rooms without a loop and the runs

Rooms with no loop of their own, and the length of the runs passing through rooms

Room	A m ²	Heat loss W	Runs	Length m
GROUND FLOOR				
Porch 0/4	2.6	170	1	1.3
Needs its own loop [8].				
Hall 0/5	-	267	0	-
Needs its own loop [8].				
FIRST FLOOR				
Landing 1/4	-	252	0	-
Needs its own loop [8].				

Area "-": no "No loop" area is drawn in the room.

The standard says the heat of pipes passing rooms they do not serve should be limited and may count for the room passed, but it gives no way to compute it [7] - so the report gives only the length of the runs, not their heat. Every heated room needs at least one loop of its own, for its temperature control [8]. The loop flows were not changed [5].

[5] EN 1264-3:2021, Formula 13 - the loop's flow from the heat in the water and the downward loss.

[7] EN 1264-3:2021, 4.1.2.1 - the heat of pipes passing rooms they do not serve: limited, may count for the room passed; no formula.

[8] EN 1264-4:2021, 4.2.2.5.2 - at least one loop in every heated room, for its temperature control.

FOR THE INSTALLER

Flow meter settings

A sheet for the manifold. Set the design flow and tick the box - never above the design flow.

[4]

Port	Loop	Room	Return °C	Setting l/min	l/h	Water Q W	Δp kPa	Set
R1 - Ground floor 7/8 ports							4.07 l/min · 351.3 m	
1	0/6/B	Living room	31.5	0.83	50	550	1.2	☐
2	0/6/A	Living room	31.5	0.65	39	430	0.7	☐
3	0/1/B	Kitchen-diner	31.0	0.48	29	334	0.4	☐
4	0/1/A	Kitchen-diner	31.0	0.53	32	370	0.6	☐
5	0/2	WC	31.0	0.21	13	147	0.1	☐
7	0/3	Utility room	31.0	0.55	33	382	0.8	☐
8	0/7	Guest room	31.0	0.82	49	575	1.4	☐
R1 - First floor 7/8 ports							3.83 l/min · 397.8 m	
1	1/5/B	Main bedroom	31.0	0.55	33	381	0.6	☐
2	1/5/A	Main bedroom	31.0	0.46	28	323	0.4	☐
3	1/1	Children's room	31.0	0.75	45	520	1.3	☐
4	1/2	Bathroom	31.0	0.52	31	365	0.9	☐
5	1/3	Study	31.0	0.65	39	450	1.2	☐
6	1/6/A	Bedroom	31.0	0.38	23	263	0.3	☐
8	1/6/B	Bedroom	31.0	0.53	32	368	0.6	☐

Water Q = (Q + Φ FB) · (1 + Ro/Ru) - the flow comes from it: G = 0.86 · water Q / σ. [5]

Δp - the loop's pressure drop: the pipe in the room and both feeders. A bold figure is over 35 kPa - split the loop or shorten its feeders. [6]

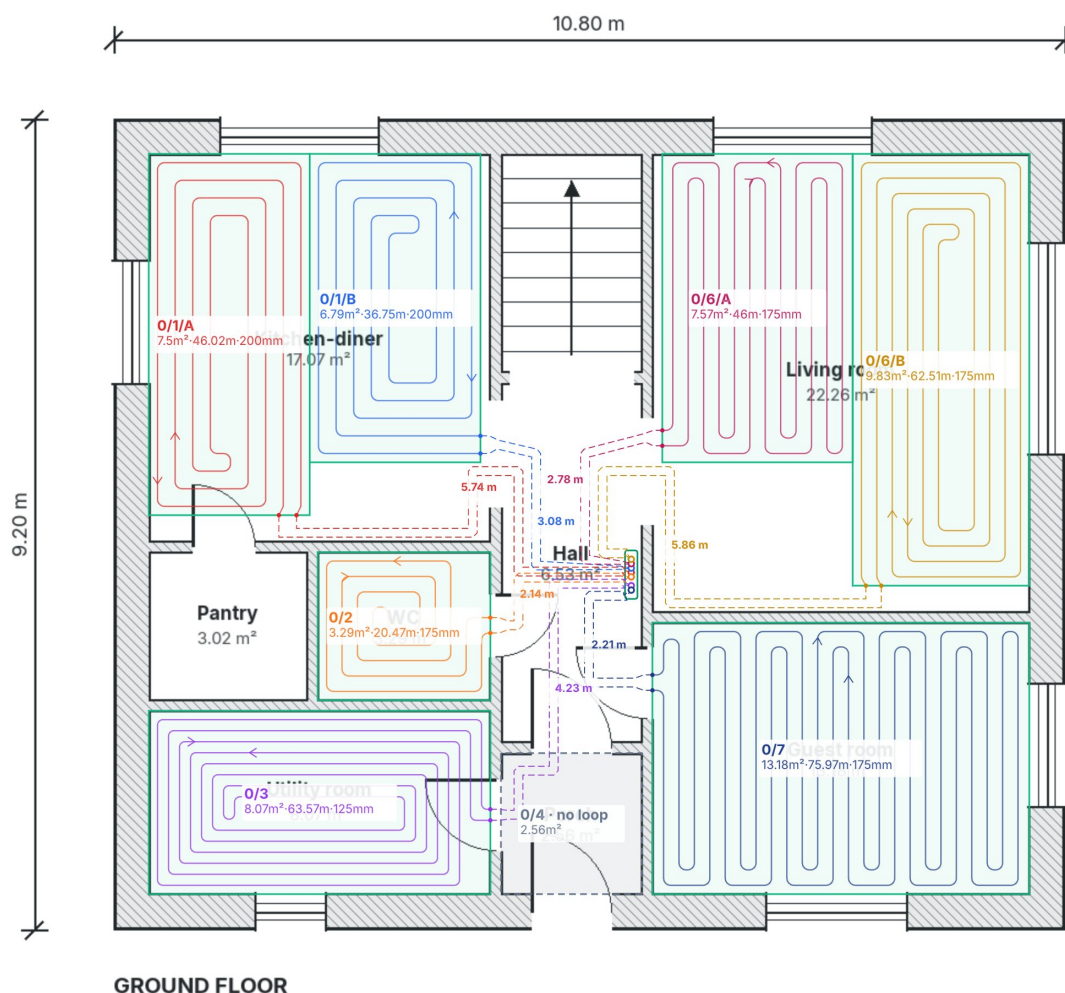
[4] EN 1264-4:2021, 4.1 - set never above the design flow.

[5] EN 1264-3:2021, Formula 13 - the loop's flow from the heat in the water and the downward loss.

[6] EN 1264-3:2021, 4.1.3.1 - a loop's pressure drop at most 35 kPa.

Plan Ground floor

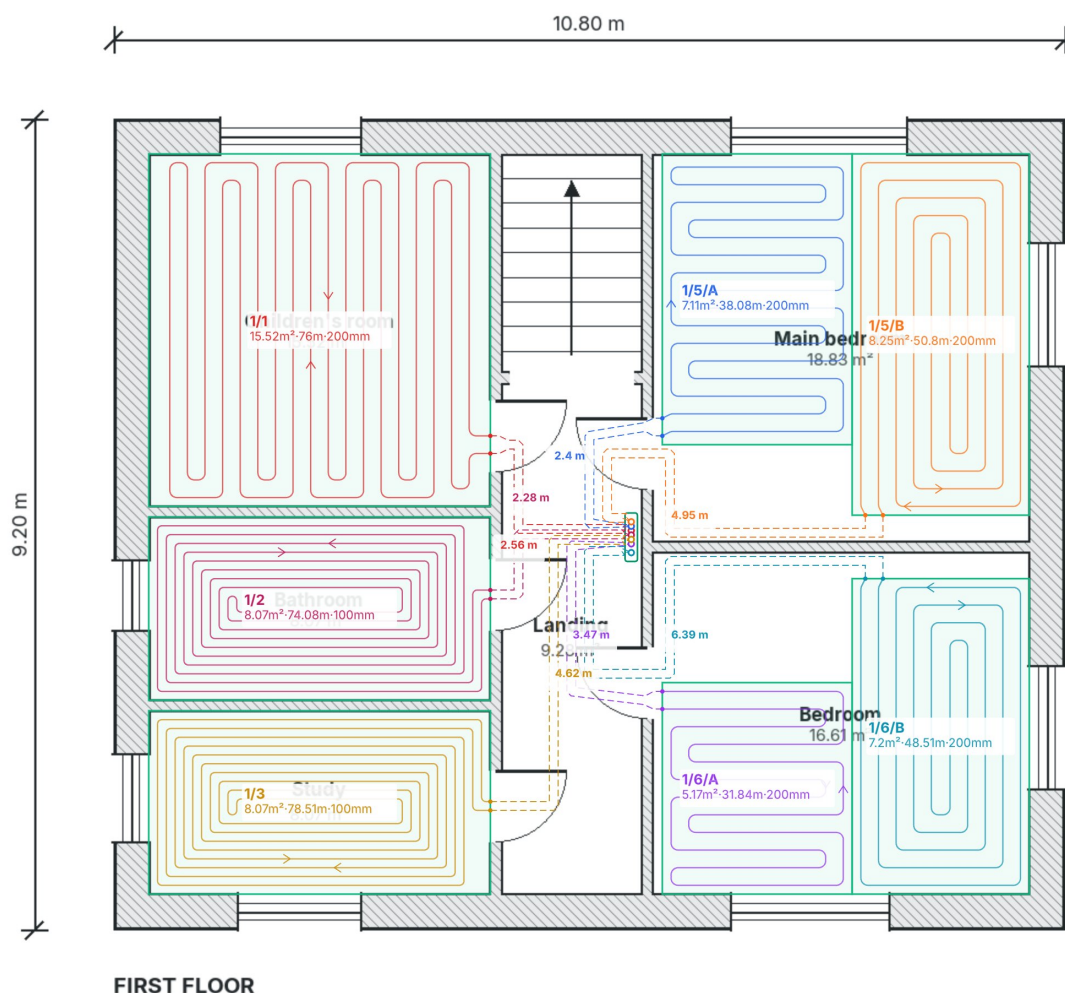
The loops and their feeds as designed. Measure lengths with the scale bar - the plan gives no 1:N scale.



2 m

Plan First floor

The loops and their feeds as designed. Measure lengths with the scale bar - the plan gives no 1:N scale.



2 m

Calculation method

The formulas behind every figure in this report, each with its clause. The same engine computes the app and this report.

$$q = K_H \cdot \Delta\theta_H$$

EN 1264-2, Formulae 1-9, type A (pipe in the screed), Tables A.1-A.3

Output per m² of floor: K_H from the spacing, pipe, covering and screed over the pipe, $\Delta\theta_H$ the log-mean water-to-room difference. Capped by the limit curve (6.5): 29 °C, $\theta_i + 9$ K in a bathroom. A loop's output comes from the pipe actually laid. A loop's edge zone (a strip up to 1.0 m along the chosen walls) is an area of its own on the 35 °C limit, and the loop's output is the zone's plus the rest of the floor's, each at the spacing of the pipe laid in it (EN 1264-3, 4.1.4, Formula 7).

$$\text{Balance} = \sum Q_{\text{loop}} - \Phi_{\text{HL}}$$

EN 1264-3, 4.1.3.2-4.1.3.3, Formulae 5, 6 and 12

The room's loop output against its whole heat loss - the Balance column. The recommended spacing is the widest (up to 200 mm) at which the floor covers the room's heat loss.

$$\theta_V - \theta_R \leq \sigma \leq \max(10 \text{ K}; \theta_V - \theta_R)$$

EN 1264-3, Formulae 8-11; the floor at the design spread and the 10 K ceiling are HeatAlgo's

Each loop's spread at the project's supply. The required supply is the temperature at which the leading loop (bathrooms aside) runs at the design spread.

$$G = 0.86 \cdot (Q + \Phi_{\text{FB}}) \cdot (1 + R_o/R_u) / \sigma$$

EN 1264-3, Formula 13

A loop's flow in l/h, with the heat lost downward (Φ_{FB} the loop's share of the floor loss, R_u from the floor element, without one EN 1264-4's minimum). The floor loss sits in the heat loss and here, as the norm reads - the flow errs on the safe side. It is the figure on the flow meter.

$$R_{\lambda,B} = \max(\text{own}; 0.10) \text{ m}^2\text{K/W}$$

EN 1264-3, 4.1.3.3

The covering's design resistance: tile (0.05) and vinyl (0.08) at 0.10, wood at 0.12, carpet at 0.15; tile in a bathroom at its own 0.05 - the norm gives bathrooms no value of their own.

$$\lambda_E = 1.2 / 1.9 \text{ W/(m}\cdot\text{K)}$$

EN 1264-2, Table C.1

Cement and anhydrite screed / concrete over the pipe.

$$q = 8.92 \cdot (\theta_{F,m} - \theta_i)^{1.1}$$

EN 1264-2, basic characteristic curve

The mean surface temperature from the loop's output at the design temperatures - an upper bound; a loop throttled at the manifold runs cooler.

$$\Delta p = f \cdot (L/d) \cdot \rho v^2 / 2$$

Darcy-Weisbach; the 35 kPa limit per EN 1264-3, 4.1.3.1

The loop's pressure drop with both feeds - the Δp column on the flow meter page.

See the method: a reference house calculated in full: heatalgo.com/en/compliance

What **this report** rests on

EN 1264-2	Floor output: the thermal characteristic, the limit curve, the screed's λ (Table C.1), the surface temperature.
EN 1264-3	Design: the floor's load (Formula 5), spread and supply (Formulae 8-11), the loop flow (Formula 13), the covering's resistance, the 35 kPa limit.
EN 1264-4	Installation: settings never above the design flow, the minimum insulation downward.
EN 12831-1	The rooms' heat loss from the heat-loss module - the heat-loss figure and the balance.

Formulas and sources of the figures: page #08.