Hot Water Recirculation Flow for Pipe Heat Loss

Recirculation flow needed to keep a domestic hot water loop within an allowed temperature drop, from pipe length, heat loss per metre and water temperature.

Method: Heat balance of a recirculation loop

Input parameters

Unit system: SI

Parameter	Value	Unit
Length of the circulation loop (flow pipes)	180.00	m
Pipe heat loss coefficient per metre	0.25000	W/(m·K)
Hot water temperature	60.000	°C
Surrounding air temperature	20.000	°C
Allowed temperature drop round the loop	5.0000	K
Return pipe inner diameter	20.000	mm

Calculated results

Parameter	Value	Unit
Loop heat loss	1,800.0	W
Recirculation mass flow	309.60	kg/h
Recirculation volume flow	5.2493	L/min
Velocity in the return pipe	0.27848	m/s

Notes for this case

• A recirculation loop keeps hot water close to the taps by circulating just enough flow to replace the heat the pipes lose: ṁ = Q/(c_pΔT), with Q = U′L(T_w − T_a) and U′ the heat loss per metre per kelvin of the insulated pipe. Water properties are taken near 60 °C (c_p = 4.186 kJ/kg·K, ρ = 983 kg/m³). Keeping the return above about 55 °C limits Legionella growth; velocities above about 0.5–1 m/s in copper risk erosion.

Formula and method

$$\dot{Q} = U' L (T_w - T_a), \quad \dot{m} = \frac{\dot{Q}}{c_p \Delta T}$$

Variables

L	Length of the circulation loop (flow pipes)	m
U'	Pipe heat loss coefficient per metre	W/(m·K)
T_w	Hot water temperature	K
T_a	Surrounding air temperature	K
ΔT	Allowed temperature drop round the loop	K
d	Return pipe inner diameter	m
$\dot{Q}$	Loop heat loss	W
$\dot{m}$	Recirculation mass flow	kg/s
$\dot{V}$	Recirculation volume flow	m³/s
v	Velocity in the return pipe	m/s

Method and standards

Recirculation flow.

Assumptions and limits

- Steady state; uniform insulation; water near 60 °C.

References

Heat balance of a recirculation loop

Report details

Report reference	FCC-7M89-5TT2 (the same inputs always give the same reference)
Generated	23 November 2026, 18:08 UTC
Calculator	Hot Water Recirculation Flow for Pipe Heat Loss
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/hvac/chillers/hot-water-recirculation-flow

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.