Hot Water Cylinder Recovery Rate and Storage Volume

Recovery rate of a hot water heater, the hot-water equivalent of a peak draw at a lower use temperature, and the storage volume to meet the peak.

Method: Energy balance of the store and mixing rule (CIBSE Guide G approach)

Input parameters

Unit system: SI

Parameter	Value	Unit
Heater power	12.000	kW
Heating efficiency	100.00	%
Cold feed temperature	10.000	°C
Storage temperature	60.000	°C
Use (mixed) temperature	40.000	°C
Peak draw at use temperature	600.00	L
Peak period	1.0000	h
Usable fraction of the store	80.000	%

Calculated results

Parameter	Value	Unit
Recovery rate (at storage temperature)	206.40	L/h
Hot fraction in mixed water	60.000	%
Peak draw as stored hot water	360.00	L
Storage volume required	192.00	L

Notes for this case

• Water taken as 1,000 kg/m³ and 4.186 kJ/(kg·K). Store at 60 °C or above against Legionella. The usable fraction allows for mixing at the cold inlet.

Formula and method

$$\dot{V}_{rec} = \frac{\eta P}{\rho c_p (t_s - t_c)}, \quad V_s = \frac{\max\left(V_{pk}\frac{t_u - t_c}{t_s - t_c} - \dot{V}_{rec} t_p,\ 0\right)}{f_u}$$

Variables

P	Heater power	W
η	Heating efficiency	-
t_c	Cold feed temperature	K
t_s	Storage temperature	K
t_u	Use (mixed) temperature	K
V_{pk}	Peak draw at use temperature	m³
t_p	Peak period	s
f_u	Usable fraction of the store	-
$\dot{V}_{rec}$	Recovery rate (at storage temperature)	m³/s
f_h	Hot fraction in mixed water	-
V_h	Peak draw as stored hot water	m³
V_s	Storage volume required	m³

Method and standards

Store energy balance.

Assumptions and limits

- Constant cold feed; perfect mixing at the outlet.

References

- Energy balance of the store and mixing rule (CIBSE Guide G approach)

Report details

Report reference	FCC-X9QA-BHW4 (the same inputs always give the same reference)
Generated	17 November 2026, 19:50 UTC
Calculator	Hot Water Cylinder Recovery Rate and Storage Volume
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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-storage-recovery

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.