Cooling Tower Evaporation, Blowdown and Make-up

Cooling tower evaporation loss, drift, blowdown and make-up water from the circulating flow, range, cycles of concentration and drift rate.

Method: IAPWS R7-97(2012) IF97; cooling tower mass balance (evaporation, drift, blowdown)

Input parameters

Unit system: SI

Parameter	Value	Unit
Circulating water flow	1.0800e+07	kg/h
Hot water temperature	41.000	°C
Cold water temperature	32.000	°C
Share of heat removed by evaporation About 0.75–0.9 in warm weather, lower in winter; 0.85 matches the common rule E ≈ 0.00085 × L × range (°F).	85.000	%
Cycles of concentration	5.0000	
Drift loss, share of circulating flow From the drift eliminator maker; modern eliminators 0.001–0.02 %.	0.020000	%

Calculated results

Parameter	Value	Unit
Make-up water	178,751	kg/h
Evaporation loss	143,001	kg/h
Blowdown	33,590	kg/h
Drift loss	2,160.0	kg/h
Heat rejected	112.83	MW

Formula and method

$$\dot{Q} = L\,[h(T_{hot}) - h(T_{cold})] \qquad E = \frac{f\dot{Q}}{h_{fg}(T_m)} \qquad D = d\,L$$

$$B = \frac{E}{C-1} - D \qquad M = E + D + B$$

Variables

L	circulating water flow	kg/s
T_{hot}	hot water temperature	K
T_{cold}	cold water temperature	K
T_m	mean water temperature	K
f	share of heat removed by evaporation	–
C	cycles of concentration	–
d	drift as a share of circulating flow	–
M	make-up water	kg/s
E	evaporation loss	kg/s
B	blowdown	kg/s
D	drift loss	kg/s
$\dot{Q}$	heat rejected	W

$h\$, \$h_{fg}$	water enthalpy and latent heat	J/kg

Method and standards

Mass balance of the tower water and a dissolved-solids balance (make-up solids leave with blowdown and drift); evaporation from the heat removed by evaporation and the latent heat at the mean water temperature (FireCAD IAPWS-IF97).

Assumptions and limits

- Steady state; all water losses are evaporation, drift and blowdown (no leaks).
- If drift alone exceeds the blowdown the cycles need, the blowdown is shown as zero and the cycles actually reached are lower; a warning gives them.
- Drift here is a share of circulating flow; the cycles-from-chemistry calculator takes it as a share of evaporation and takes all the heat as leaving by evaporation ($f = 1$).

References

• IAPWS R7-97(2012) IF97
• cooling tower mass balance (evaporation, drift, blowdown)

Report details

Report reference	FCC-6HKC-1EG0 (the same inputs always give the same reference)
Generated	17 November 2026, 19:37 UTC
Calculator	Cooling Tower Evaporation, Blowdown and Make-up
Method last reviewed	11 November 2026
Software release	FireCAD Calc, release of 17 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/boilers-power-plant/condensers-cooling/cooling-tower-water-balance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.