Water-Side Heat Transfer Coefficient: Quick Estimate

Tube-side heat transfer coefficient of water in turbulent flow from velocity, bore and temperature by Ganapathy's simplified expression for economisers.

Method: Ganapathy; Steam Plant Calculations Manual; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Water flow per tube (or per pass)	22,680	kg/h
Tube inner diameter	73.660	mm
Mean water temperature	121.11	°C

Calculated results

Parameter	Value	Unit
Water velocity	1.5690	m/s
Tube-side coefficient	9,149.7	W/(m²·K)

Notes for this case

- Water-side resistance is usually small next to the gas side; the estimate suits turbulent flow (velocities above about 0.3 m/s).

Formula and method

$$h_i = (150 + 1.55\,t)\,\frac{V^{0.8}}{d_i^{0.2}} \quad (\mathrm{Btu/ft^2\,h\,°F};\ t\ °F,\ V\ ft/s,\ d_i\ in)$$

Variables

W	Water flow per tube (or per pass)	kg/s
d_i	Tube inner diameter	m
t	Mean water temperature	K
V	Water velocity	m/s
h_i	Tube-side coefficient	W/(m²·K)

Method and standards

Ganapathy's Eq. (13).

Assumptions and limits

- Ganapathy's expression is dimensional (°F, ft/s, inches, Btu/(ft²·h·°F)); the page converts to and from SI through the unit registry.
- Turbulent flow only. No Reynolds number is computed; the page warns below about 0.3 m/s, where the flow may not be turbulent.
- Turbulent single-phase water.

References

- Ganapathy
- Steam Plant Calculations Manual
- 2nd ed. (Marcel Dekker, 1993)
- Q4.03b
- Eq. (13)
- Water specific volume from IAPWS-IF97 (saturated liquid at t)

Report details

Report reference	FCC-04TS-AWKX (the same inputs always give the same reference)
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Calculator	Water-Side Heat Transfer Coefficient: Quick Estimate
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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/mechanical/heat-transfer/water-tube-side-coefficient-quick

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.