Rod Bundle Subchannel Geometry and Heat Transfer (Weisman)

Flow area, hydraulic diameter, Reynolds number and the Weisman rod-bundle heat transfer coefficient for water flowing along a square or triangular lattice.

Method: Weisman correlation for longitudinal flow in rod bundles

Input parameters

Unit system: SI

Parameter	Value	Unit
Lattice	Square	
Rod pitch	12.600	mm
Rod outer diameter	9.5000	mm
Coolant pressure	15.500	MPa
Bulk coolant temperature	310.00	°C
Mass flux	3,500.0	kg/(m²·s)

Calculated results

Parameter	Value	Unit
Pitch-to-diameter ratio	1.3263	
Flow area per rod	87.878	mm²
Hydraulic diameter	11.778	mm
Reynolds number	487,548	
Prandtl number	0.89819	
Weisman bundle factor	1.3789	
Nusselt number	1,086.8	
Heat transfer coefficient	49,889	W/(m²·K)

Notes for this case

- Weisman: Nu = ψ·0.023Re^0.8Pr^0.333 with ψ = 1.826P/D − 1.0430 (square, 1.1 ≤ P/D ≤ 1.3) or 1.130P/D − 0.2609 (triangular, 1.1 ≤ P/D ≤ 1.5). Water and steam properties from IAPWS-IF97.
- P/D is outside the range of the correlation.

Formula and method

$$A = P^2 - \frac{\pi D^2}{4} \text{ or } \frac{\sqrt{3}}{2}P^2 - \frac{\pi D^2}{4}, \quad D_h = \frac{4A}{\pi D}, \quad Nu = \psi 0.023 Re^{0.8} Pr^{0.333}$$

Variables

$\mathrm{lattice}$	Lattice	-
P	Rod pitch	m
D	Rod outer diameter	m
p	Coolant pressure	Pa
T	Bulk coolant temperature	K
G	Mass flux	kg/(m²·s)
P/D	Pitch-to-diameter ratio	-
A_{cell}	Flow area per rod	m²

D_h	Hydraulic diameter	m
Re	Reynolds number	-
Pr	Prandtl number	-
ψ	Weisman bundle factor	-
Nu	Nusselt number	-
h	Heat transfer coefficient	W/(m²·K)

Method and standards

Rod-bundle convection.

Assumptions and limits

- Fully developed turbulent single-phase flow; infinite lattice (no wall subchannels).

References

Weisman correlation for longitudinal flow in rod bundles

Report details

Report reference	FCC-CPDW-3V1W (the same inputs always give the same reference)
Generated	23 November 2026, 17:35 UTC
Calculator	Rod Bundle Subchannel Geometry and Heat Transfer (Weisman)
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/boilers-power-plant/nuclear-power/rod-bundle-heat-transfer-weisman

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.