Turbine Blade Height from Steam Flow, Mean Diameter and Admission

Blade (nozzle) height needed to pass a steam flow at a mean diameter, axial velocity and arc of admission, with blade speed from diameter and rpm.

Input parameters

Unit system: SI

Parameter	Value	Unit
Steam flow	180.00	t/h
Specific volume at the blade row	0.25000	m³/kg
Mean blade diameter	0.80000	m
Speed	3,000.0	rpm
Steam velocity leaving the nozzles	300.00	m/s
Nozzle exit angle	18.000	°
Arc of admission (1 = full)	100.00	%
Blade blockage factor (thickness), about 0.9	90.000	%

Calculated results

Parameter	Value	Unit
Mean blade speed	125.66	m/s
Axial velocity	92.705	m/s
Flow area needed	0.13484	m²
Blade height	59.611	mm
Height-to-diameter ratio	0.074513	
Velocity ratio	0.41888	

Formula and method

$$A = \frac{\dot{m} v}{V_1 \sin \alpha}, \quad h_b = \frac{A}{\pi D_m \varepsilon k}, \quad V_b = \frac{\pi D_m N}{60}$$

Variables

$\dot{m}$	Steam flow	kg/s
v	Specific volume at the blade row	m³/kg
D_m	Mean blade diameter	m
N	Speed	rad/s
V_1	Steam velocity leaving the nozzles	m/s
α	Nozzle exit angle	rad
ε	Arc of admission (1 = full)	-
k	Blade blockage factor (thickness), about 0.9	-
V_b	Mean blade speed	m/s
V_a	Axial velocity	m/s
A	Flow area needed	m²
h_b	Blade height	m

h_b/D_m	Height-to-diameter ratio	-
V_b/V_1	Velocity ratio	-

Method and standards

Continuity through the blade annulus.

Assumptions and limits

- Uniform flow at mean diameter.

Report details

Report reference	FCC-WGAN-0CRZ (the same inputs always give the same reference)
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Calculator	Turbine Blade Height from Steam Flow, Mean Diameter and Admission
Method last reviewed	17 November 2026
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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/steam-turbines/turbine-blade-height-admission

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.