Pipe Velocity and Pipe Size

Fluid velocity in a pipe from the flow and inside diameter, and the inside diameter needed for a target velocity, with mass flow and velocity pressure.

Method: Continuity equation

Input parameters

Unit system: SI

Parameter	Value	Unit
Volume flow	50.000	m³/h
Pipe inside diameter	102.30	mm
Target velocity for sizing (0 = skip)	0	m/s
Fluid density	998.20	kg/m³

Calculated results

Parameter	Value	Unit
Velocity	1.6898	m/s
Flow area	0.008219	m²
Mass flow	49,910	kg/h
Velocity pressure ρv²/2	1,425.1	Pa

Formula and method

$$v = \frac{4Q}{\pi D^2} \qquad D_{req} = \sqrt{\frac{4Q}{\pi v_t}} \qquad \dot{m} = \rho Q \qquad p_d = \frac{\rho v^2}{2}$$

Variables

Q	volume flow	m³/s
D	pipe inside diameter	m
v_t	target velocity for sizing	m/s
ρ	fluid density	kg/m³
v	mean velocity	m/s
D_{req}	inside diameter for the target velocity	m
A	flow area	m²
$\dot{m}$	mass flow	kg/s
p_d	velocity pressure	Pa

Method and standards

Continuity for a full circular pipe with a uniform mean velocity.

Assumptions and limits

- Full pipe, single phase.
- The required diameter is exact; choose the next standard pipe size whose bore is at least that.
- For gases and steam use the volume flow at the line pressure and temperature.

References

- Continuity equation

Report details

Report reference	FCC-XDXZ-B1CK (the same inputs always give the same reference)
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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/mechanical/fluid-mechanics/pipe-velocity

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.