# Steam Pipe Sizing by Velocity

Inside diameter of a steam pipe for a mass flow and design velocity, with the steam's specific volume from IAPWS-IF97 and the velocity in a chosen pipe.

**Method:** IAPWS R7-97(2012) IF97 (specific volume); Continuity equation

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Steam flow | 10,000 | kg/h |
| Steam pressure (absolute)<br>Absolute; choose a gauge unit to enter gauge readings. | 10.500 | bar |
| Steam condition | Dry saturated | |
| Steam temperature (superheated only) | 250.00 | °C |
| Design velocity<br>From your piping specification; the calculator does not suggest one. | 25.000 | m/s |
| Chosen pipe inside diameter to check (0 = skip) | 154.10 | mm |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Inside diameter for the design velocity | 162.00 | mm |
| Velocity in the chosen pipe | 27.628 | m/s |
| Volume flow of steam | 1,855.0 | m³/h |
| Specific volume of the steam | 0.18550 | m³/kg |

## Formula and method

$$\dot{V} = \dot{m}\, v \qquad D = \sqrt{\frac{4\,\dot{V}}{\pi\, u}} \qquad u_{sel} = \frac{4\,\dot{V}}{\pi\, D_{sel}^{2}}$$

### Variables

| | | |
|---|---|---|
| $\dot{m}$ | steam flow | kg/s |
| $p$ | steam pressure, absolute | Pa |
| $\mathrm{state}$ | dry saturated or superheated steam | – |
| $T_s$ | steam temperature (superheated) | K |
| $u$ | design velocity | m/s |
| $D_{sel}$ | chosen pipe inside diameter | m |
| $D$ | inside diameter for the design velocity | m |
| $u_{sel}$ | velocity in the chosen pipe | m/s |
| $\dot{V}$ | volume flow of steam | m³/s |
| $v$ | specific volume of the steam | m³/kg |

### Method and standards

Continuity for a full circular pipe, with the specific volume from FireCAD's IAPWS-IF97 implementation.

### Assumptions and limits

- Sizing by velocity only; check the pressure drop with the steam pipe pressure drop calculator.
- Inside diameter: outside diameter minus twice the wall thickness.
- Dry steam; wet steam needs separators and drainage.

### References

- IAPWS R7-97(2012) IF97 (specific volume)
- Continuity equation

## Report details

| | |
|---|---|
| Report reference | FCC-KR9E-1Y4T (the same inputs always give the same reference) |
| Generated | 17 November 2026, 19:44 UTC |
| Calculator | Steam Pipe Sizing by Velocity |
| Method last reviewed | 10 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/mechanical/piping/steam-pipe-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.