Pipe Weight per Metre (Empty and Water-Filled)

Mass per metre of a pipe or tube from outside diameter, wall thickness and material density, with the contents when full of water and the total for a length.

Method: Pipe geometry (m' = ρ π (D − t) t)

Input parameters

Unit system: SI

Parameter	Value	Unit
Outside diameter	168.30	mm
Wall thickness	7.1100	mm
Material density Carbon steel about 7850 kg/m³; stainless about 7900–8000; copper 8940; aluminium 2700.	7,850.0	kg/m³
Contents density (water ≈ 1000)	1,000.0	kg/m³
Length	6.0000	m

Calculated results

Parameter	Value	Unit
Pipe mass per metre	28.264	kg/m
Contents mass per metre when full	18.646	kg/m
Full pipe mass per metre	46.909	kg/m
Pipe mass for the length	169.58	kg
Inside diameter	154.08	mm

Notes for this case

- Plain pipe: add insulation, cladding, flanges and valves for support loads.

Formula and method

$$m' = \rho_m \, \pi \, (D_o - t) \, t \qquad m'_f = \rho_f \, \frac{\pi D_i^2}{4}, \; D_i = D_o - 2t \qquad m'_t = m' + m'_f \qquad m = m' L$$

Variables

D_o	outside diameter	m
t	wall thickness	m
ρ_m	material density	kg/m³
ρ_f	contents density	kg/m³
L	length	m
m'	pipe mass per metre	kg/m
m'_f	contents per metre	kg/m
m'_t	full pipe per metre	kg/m
m	mass of the length	kg
D_i	inside diameter	m

Method and standards

Exact annulus area times density.

Assumptions and limits

- Plain straight pipe.

References

- Pipe geometry ($m' = \rho \pi (D - t) t$)

Report details

Report reference	FCC-928V-CM70 (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/materials/properties/pipe-weight-per-metre

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.