Weight of Pipe Filled with Water and Insulated

Weight per metre of a steel pipe, its contents and insulation with cladding, and the total for a length, for support and hanger loads.

Method: Mass of annular sections

Input parameters

Unit system: SI

Parameter	Value	Unit
Pipe outside diameter	168.30	mm
Wall thickness	7.1100	mm
Pipe material density	7,850.0	kg/m³
Contents density (0 if empty or gas)	998.00	kg/m³
Insulation thickness	50.000	mm
Insulation density	120.00	kg/m³
Cladding weight per metre	2.0000	kg/m
Length (for the total)	6.0000	m

Calculated results

Parameter	Value	Unit
Pipe	28.264	kg/m
Contents	18.609	kg/m
Insulation	4.1149	kg/m
Total per metre	52.987	kg/m
Total for the length	317.92	kg

Notes for this case

- Results are masses per metre; the weight (force) per metre is w g = 519.6 N/m, for support loads and span checks.

Formula and method

$$w_p = \rho_s \frac{\pi(D_o^2 - D_i^2)}{4}, \quad w_f = \rho_f \frac{\pi D_i^2}{4}, \quad w_i = \rho_i \frac{\pi\left[(D_o + 2t_i)^2 - D_o^2\right]}{4}$$

Variables

D_o	Pipe outside diameter	m
t	Wall thickness	m
ρ_s	Pipe material density	kg/m³
ρ_f	Contents density (0 if empty or gas)	kg/m³
t_i	Insulation thickness	m
ρ_i	Insulation density	kg/m³
w_c	Cladding weight per metre	kg/m
L	Length (for the total)	m
w_p	Pipe	kg/m
w_f	Contents	kg/m
w_i	Insulation	kg/m
w	Total per metre	kg/m
m	Total for the length	kg

Method and standards

Areas times densities.

Assumptions and limits

- Straight pipe.
- Outputs are mass per metre (kg/m); multiply by g = 9.806 65 m/s² for the weight in N/m (given in a note).

References

- Mass of annular sections

Report details

Report reference	FCC-EDCK-4XTY (the same inputs always give the same reference)
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Calculator	Weight of Pipe Filled with Water and Insulated
Method last reviewed	12 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/mechanical/piping/pipe-filled-weight

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.