Pipe Volume, Contents and Fill or Drain Time

Internal volume of a pipeline from its bore and length, the mass of its contents, and the time to fill or drain it at a flow, for commissioning and hydrotests.

Method: V = π d² L / 4

Input parameters

Unit system: SI

Parameter	Value	Unit
Inside diameter	200.00	mm
Length	500.00	m
Contents density	998.00	kg/m³
Fill or drain flow	30.000	m³/h

Calculated results

Parameter	Value	Unit
Volume per metre	31.416	L
Total volume	15.708	m³
Mass of contents	15,677	kg
Fill or drain time	31.416	min

Formula and method

$$V = \frac{\pi d^2}{4} L, \quad t = \frac{V}{Q}$$

Variables

d	Inside diameter	m
L	Length	m
ρ	Contents density	kg/m³
Q	Fill or drain flow	m³/s
V'	Volume per metre	m³
V	Total volume	m³
m	Mass of contents	kg
t	Fill or drain time	s

Method and standards

Geometry.

Assumptions and limits

- Uniform bore.
- Constant flow: gravity draining slows as the head falls, so a gravity drain takes longer than V/Q at the starting flow.

References

- V = π d² L / 4

Report details

Report reference	FCC-X3VT-EC1Y (the same inputs always give the same reference)
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Calculator	Pipe Volume, Contents and Fill or Drain Time
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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-volume-fill-time

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.