Evaporator Vapour Pipe Size

Diameter of a vapour pipe between evaporator effects from the vapour flow, its saturation temperature (IF97 specific volume) and Hugot's velocities (Table 32.7).

Method: Hugot; Handbook of Cane Sugar Engineering; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Vapour flow	20,000	kg/h
Vapour saturation temperature	103.00	°C
Vapour velocity Hugot: exhaust 25–30 m/s; quadruple vapours 30–35, 35–40, 40–45, 50–60 m/s; to the condenser up to 75.	25.000	m/s
Margin on flow	1.1000	

Calculated results

Parameter	Value	Unit
Specific volume of the vapour	1.5140	m³/kg
Vapour volume flow	9.2519	m³/s
Pipe area	0.37008	m²
Pipe diameter	686.44	mm

Notes for this case

- Hugot's example: 20 000 kg/h at 103 °C and 25 m/s needs about 0.37 m², a 700 mm pipe.

Formula and method

$$\dot{V} = kP v''(T), \quad A = \frac{\dot{V}}{V}, \quad D = \sqrt{\frac{4A}{\pi}}$$

Variables

P	Vapour flow	kg/s
T	Vapour saturation temperature	K
V	Vapour velocity	m/s
k	Margin on flow	-
v''	Specific volume of the vapour	m³/kg
$\dot{V}$	Vapour volume flow	m³/s
A	Pipe area	m²
D	Pipe diameter	m

Method and standards

Continuity with IF97 specific volume.

Assumptions and limits

- Saturated vapour.
- The velocity you enter is not checked against Hugot's ranges for each effect (given in the help), and no pressure drop is computed: check long lines separately.

References

- Hugot
- Handbook of Cane Sugar Engineering
- 3rd ed. (Elsevier, 1986)

- ch. 32
- steam and vapour pipes
- Table 32.7 and example
- pp. 513–515
- Specific volume from IAPWS-IF97

Report details

Report reference	FCC-483X-NPCY (the same inputs always give the same reference)
Generated	17 November 2026, 19:36 UTC
Calculator	Evaporator Vapour Pipe Size
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/sugar-ethanol/evaporation/evaporator-vapour-pipe

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.