Gas Pipes in Series: Equivalent Length

Equivalent length of up to three gas pipe segments of different bore in series, expressed in the bore of the first, for the same flow and transmission factor.

Method: Menon; Gas Pipeline Hydraulics (CRC Press, 2005); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Length of segment 1	16.000	km
Inside diameter of segment 1	393.70	mm
Length of segment 2	24.000	km
Inside diameter of segment 2	342.90	mm
Length of segment 3 (0 = none)	16.000	km
Inside diameter of segment 3	292.10	mm

Calculated results

Parameter	Value	Unit
Equivalent length of segment 2	47.885	km
Equivalent length of segment 3	71.169	km
Total equivalent length in diameter D_1	135.05	km

Notes for this case

• Valid when the same flow passes through every segment (no deliveries between them) and the transmission factor is the same; use the total in the flow equation with diameter D_1.

Formula and method

$$L_e = L_1 + L_2 \left(\frac{D_1}{D_2}\right)^5 + L_3 \left(\frac{D_1}{D_3}\right)^5$$

Variables

L_1	Length of segment 1	m
D_1	Inside diameter of segment 1	m
L_2	Length of segment 2	m
D_2	Inside diameter of segment 2	m
L_3	Length of segment 3 (0 = none)	m
D_3	Inside diameter of segment 3	m
L_{e2}	Equivalent length of segment 2	m
L_{e3}	Equivalent length of segment 3	m
L_e	Total equivalent length in diameter D_1	m

Method and standards

Equivalent length from the general flow equation.

Assumptions and limits

- Same flow and transmission factor in every segment.

References

• Menon
• Gas Pipeline Hydraulics (CRC Press, 2005)

- ch. 3.6
- eqs. 3.1–3.6

Report details

Report reference	FCC-W0DT-SG68 (the same inputs always give the same reference)
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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/chemical/oil-gas/gas-pipes-series-equivalent-length

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.