Actual Trays and Column Height from Theoretical Stages

Actual trays from theoretical stages and overall tray efficiency, and the tower height from tray spacing and the top and bottom allowances.

Method: Perry's Chemical Engineers' Handbook; 9th ed. (McGraw-Hill, 2019); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Theoretical stages in the column (reboiler excluded)	20.000	
Overall tray efficiency Perry's Table 14-12: ethanol–water sieve trays 75–85 %.	75.000	%
Tray spacing	600.00	mm
Top allowance	1.2000	m
Bottom (sump) allowance	2.0000	m

Calculated results

Parameter	Value	Unit
Actual trays (rounded up)	27.000	
Tower height (tangent to tangent)	18.800	m

Formula and method

$$N_a = \left\lceil \frac{N_t}{E_O} \right\rceil, \quad H = (N_a - 1) S_T + H_{top} + H_{bot}$$

Variables

N_t	Theoretical stages in the column (reboiler excluded)	-
E_O	Overall tray efficiency	-
S_T	Tray spacing	m
H_{top}	Top allowance	m
H_{bot}	Bottom (sump) allowance	m
N_a	Actual trays (rounded up)	-
H	Tower height (tangent to tangent)	m

Method and standards

Overall efficiency definition and tray stacking.

Assumptions and limits

- Uniform spacing; allowances from the user.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 14 (equipment for distillation and gas absorption)
- overall efficiency and Table 14-12 (representative tray efficiencies)

Report details

Report reference	FCC-KZ2J-AQJY (the same inputs always give the same reference)
Generated	17 November 2026, 19:35 UTC
Calculator	Actual Trays and Column Height from Theoretical Stages
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/chemical/separation/column-trays-and-height

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.