

PROCESS DESIGN PRACTICES TOWERS

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9.3 Tower Layout

- Layout and dimensions are largely from Henry Kister, “Distillation Design” and “Distillation Operation”.
- Typically many layouts work, use the simplest, proven design.
- Refer to “Vessels” section for other nozzle and flange requirements.

9.3.1 Inlet Nozzles/Piping

- Nozzle typically same size as connecting pipe.
- Enlarge nozzle to meet velocity criteria:
 - $\rho v^2 \leq 1600 - 3600 (lb/ft^3 \times ft^2/s^2)$
 - Change pipe size 10 pipe diameters before nozzle
- Feeds should distribute fluid evenly to all passes.
- Never direct feed towards or into the liquid phase (downcomers, traps or boot), except to quench surge volume with cold liquid.
- Vapour feed usually doesn't have a distributor, except to prevent corrosion/erosion.
- Feed outlet velocity from distributor pipe or holes/slots:

	Liquid (ft/s)	2-Phase (psi)	
Minimum	2-3	0.25	To prevent vibration
Maximum	4-6	0.5	To reduce turbulence

- Bottom tray must have side downcomers, to reduce nr of reboiler return nozzles.

9.3.2 Outlet Nozzles/Piping

- Typical surge time in towers is 2-5 minutes on total flow (net+reboil/pumparound), distance rounded up to standard float size.
- Outlet nozzles are sized for pump suction (0.2 psi/100ft) or self venting flow ($v < 1$ ft/s).
- Typically vortex breaker is provided at vessel bottom, but not side draws. Vortex breaker not necessary for self venting flow (Sloley, CEP, Jun 1998).
- Nozzle bottom must be flush with tray (to drain tray completely).