

Ducts and Design

General rules for duct design:

1. Air should be conveyed as directly as possible to save space, power and material
2. Sudden changes in directions should be avoided. When not possible to avoid sudden changes, turning vanes should be used to reduce pressure loss
3. Diverging sections should be gradual. Angle of divergence $\leq 20^\circ$
4. Aspect ratio should be as close to 1.0 as possible. Normally, it should not exceed 4
5. Air velocities should be within permissible limits to reduce noise and vibration
6. Duct material should be as smooth as possible to reduce frictional losses

Classification of duct systems:

Ducts are classified based on the load on duct due to air pressure and turbulence. The classification varies from application to application, such as for residences, commercial systems, industrial systems etc. For example, one such classification is given below: Low pressure systems: Velocity ≤ 10 m/s, static pressure ≤ 5 cm H₂O (g) Medium pressure systems: Velocity ≤ 10 m/s, static pressure ≤ 15 cm H₂O (g) High pressure systems: Velocity > 10 m/s, static pressure 15

Cooling Towers

Crossflow cooling towers

In crossflow towers the water flows vertically through the fill while the air flows horizontally, across the flow of the falling water. Because of this, air does not have to pass through the distribution system, permitting the use of gravity flow hot water distribution basins mounted at the top of the unit above the fill. These basins are universally applied on all crossflow towers.



Counterflow cooling towers

Counterflow towers are designed so that air flows vertically upward, counter to the flow of falling water in the fill. Because of this vertical airflow, it is not possible to use the open, gravity-flow basins typical in crossflow designs. Instead, counterflow towers use pressurized, pipe-type spray systems to spray water onto the top of the fill. Since air must be able to pass through the spray system, the pipes and nozzles must be farther apart so as not to restrict airflow.

