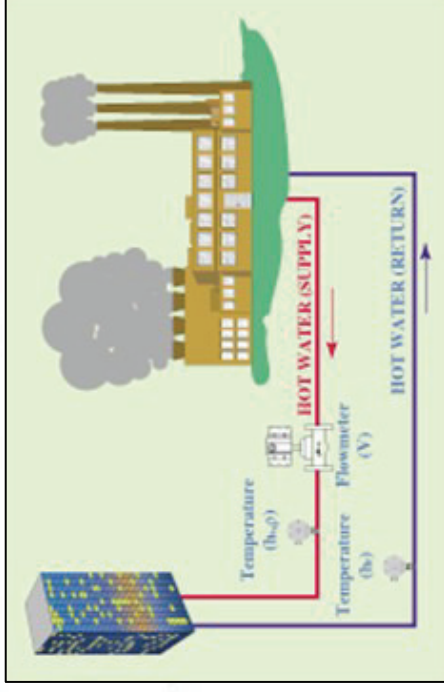


# Energy Flow



- Chilled/hot water energy (Btu) calculations require
  - (1) flow and
  - (2) temperature inputs.
- Btu is defined as the amount of energy required to raise the temperature of 1lb water at 39°F by 1°F.

$$\dot{E} = \dot{m} (h_s - h_r)$$

$$\dot{E} = A * V * \rho * (h_s - h_r)$$

$$\dot{E} = \text{ft}^2 * \frac{\text{ft}}{\text{sec}} * \frac{\text{lbs}}{\text{ft}^3} * \frac{\text{Btu}}{\text{lbs}}$$

$$\dot{E} = \frac{\text{Btu}}{\text{sec}}$$

where:

- $\dot{E}$  = energy flow (Btu/sec)
- $\dot{m}$  = mass flow (lbs/sec)
- A = cross sectional area (ft<sup>2</sup>)
- V = average fluid velocity (ft/sec)
- $\rho$  = density (lbs/ft<sup>3</sup>)
- $h_s$  = Btu's (heat content) of water at supply temperature (Btu/lbs)
- $h_r$  = Btu's (heat content) of water at return temperature (Btu/lbs)