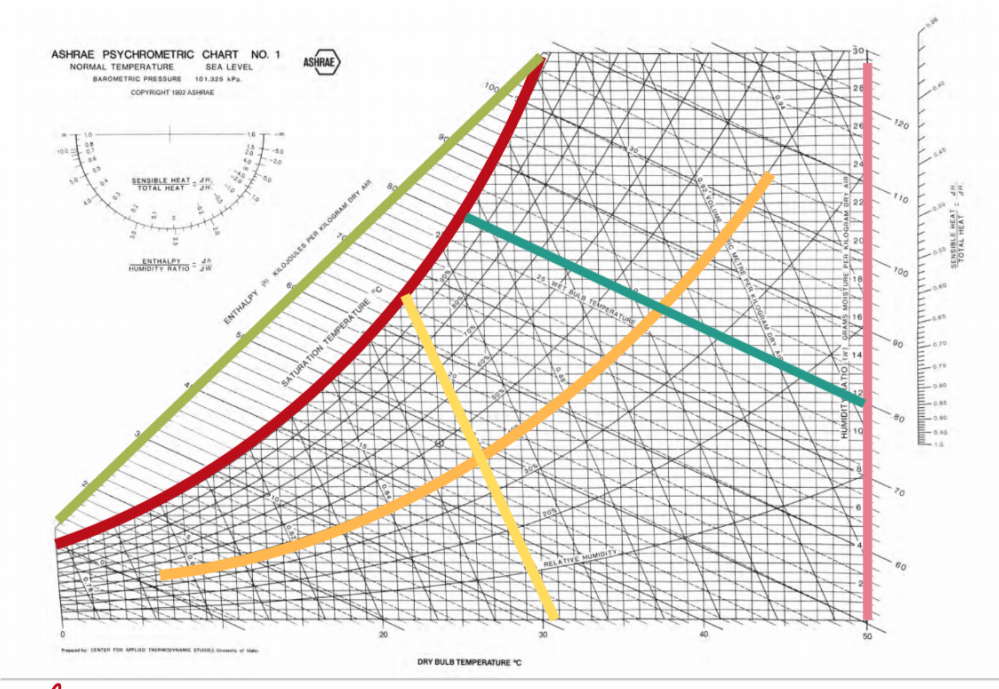
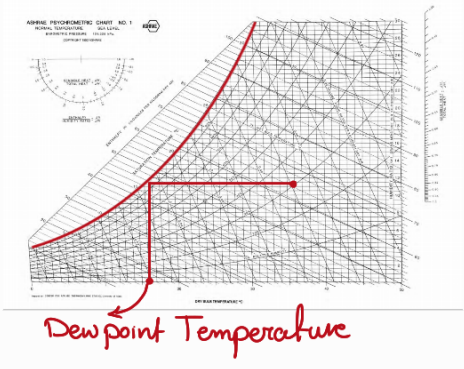
Chapter 3
Psychrometry Chart

It studies properties of mixtures of air and water vapor



Saturation line

- Air is saturated which means that any in temperature will result in condensation of water vapor into liquid



Relative humidity

Ratio of mole fraction of water vapor in moist air to mole fraction of water vapor in saturated air

For ideal Gas

$$\varnothing = \frac{P_{partial\ of\ water\ vapor}}{P_{sat\ of\ pure\ water}}$$

Humidity Ratio

It represents the mass of water interspersed in each Kilogram of dry air

$$\omega = \frac{\text{Kg of water vapor}}{\text{Kg of dry air}}$$

Enthalpy

Enthalpy of the mixture $h = h_{\text{dry air}} + h_{\text{water vapor}}$

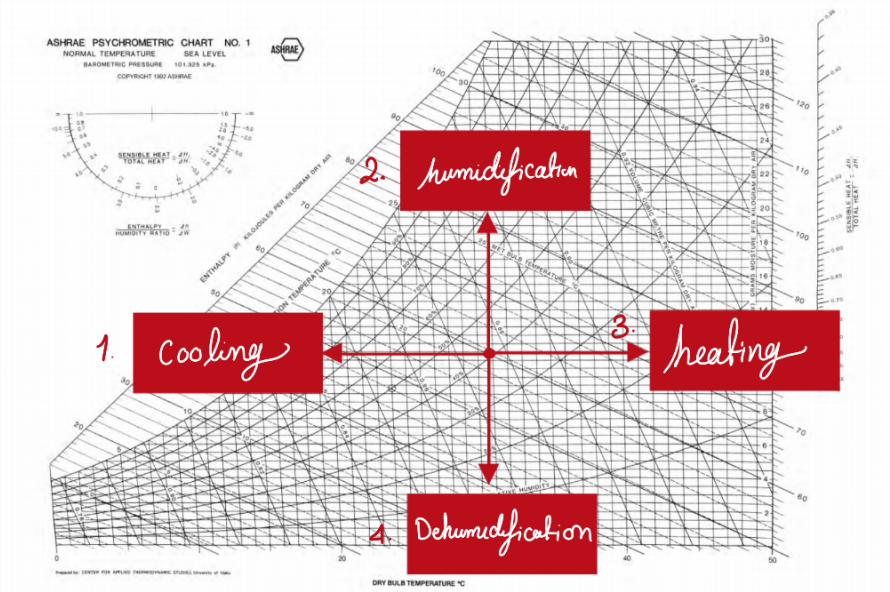
Specific volume

$$v = \frac{\text{cubic meters of mixture}}{\text{Kg of dry air}}$$

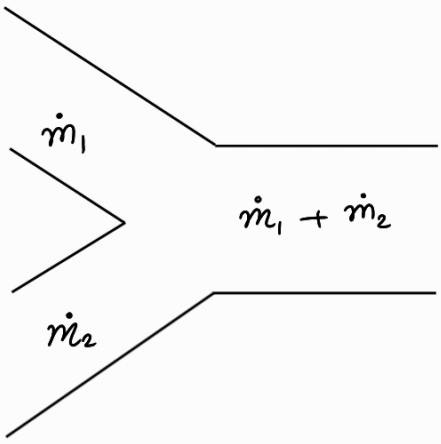
Wet Bulb temperature

It is the temperature measured by a thermometer immersed in water while air passes through the sprayed water.

Processes



5. Mixing Two air streams



Formulas applicable are:

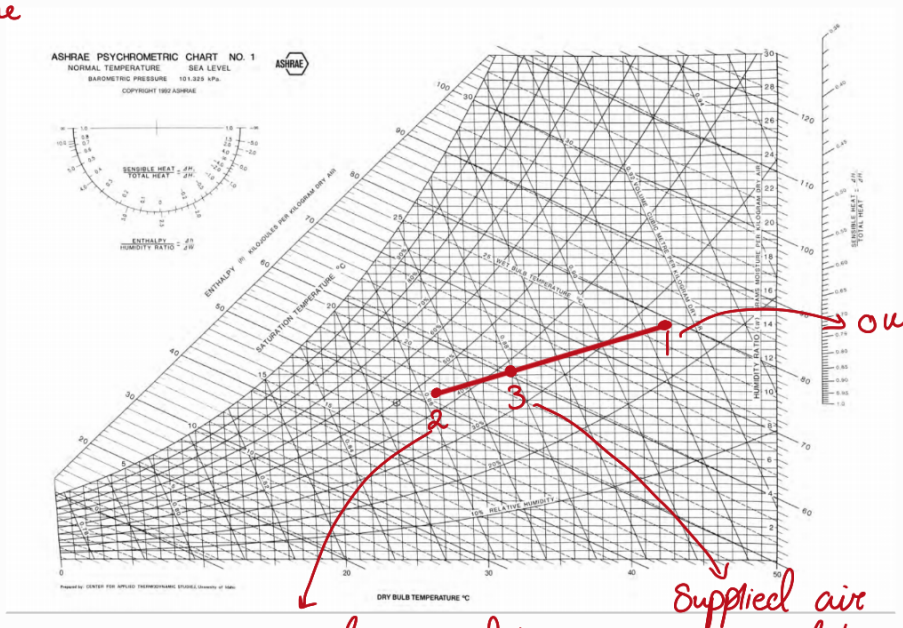
$$\dot{m}_1 h_1 + \dot{m}_2 h_2 = (\dot{m}_1 + \dot{m}_2) h_3$$

$$\dot{m}_1 \omega_1 + \dot{m}_2 \omega_2 = (\dot{m}_1 + \dot{m}_2) \omega_3$$

Example: in Air conditioning

Distances on line

$$\frac{1-3}{2-3} = \frac{\omega_2}{\omega_1}$$



Sensible and latent heat transfer

- When air flows past a wetted surface there is a latent and a sensible heat transfer
- Heat will transfer due to Temperature difference
- Mass will transfer due to pressure difference (thermal energy transfer) → latent heat must be removed or added (↓ in condensation, ↓ in evaporation)

$$Q_{sen} = h_c A (\Delta T)$$

(h_c: convection coefficient)

$$Q_{lat} = h_D A (\Delta \omega)$$

(h_D: Constant)

$$h_D = \frac{h_c}{C_{pm}}$$

(C_{pm}: specific heat of moist air)