Enthalpy of Moist Air

- Gibb's law states:

$$h_m = h_a + w h_{wv}$$

$$h_a = C_{pa}.t$$

(assuming datum at 0 °C)

h_{wv}= superheated steam at p_{wv} & t

It can be approximated as (at low pressure)

$$h_{wv} = 2501 + C_{pv}.t$$

h_{fg} (0°C) 1.86 kJ/kgK

At low pressure for an ideal gas, enthalpy is a function of temperature only.

Humid Specific Heat

$$h = (C_{pa} + wC_{pv})t + wh_{fg(0^0C)}$$

$$= C_{pm}t + wh_{fg(0^0C)}$$

Where C_{pm} = 1.006 + w 1.86

An approx. value of c_{pm} is 1.0216 kJ/kgK (Arora, 2009)

Specific volume

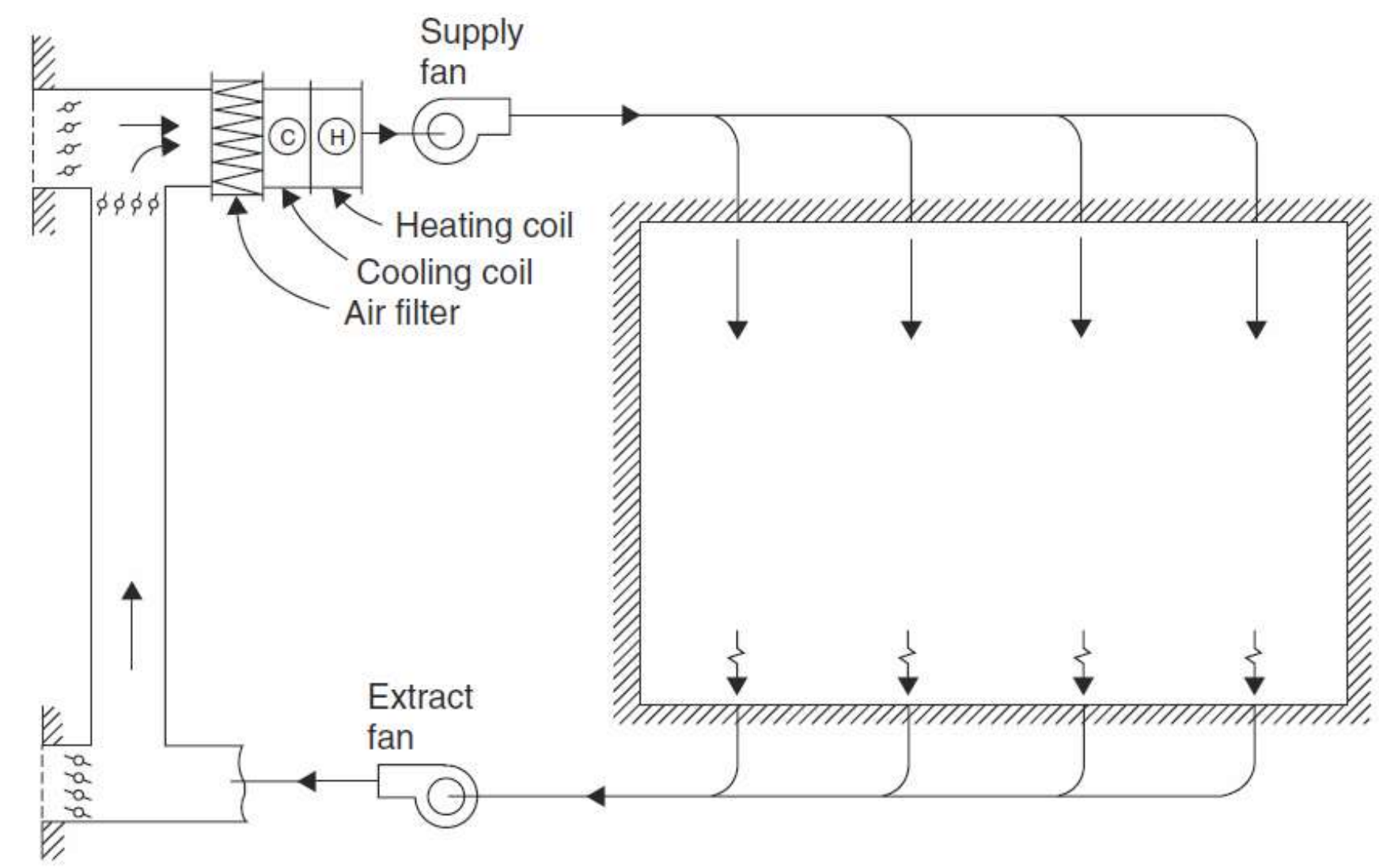
- Volume of moist air per unit mass of dry air

$$v = \frac{RT}{28.966(p - p_w)} = \frac{R_{da}T}{p - p_w}$$

Common Psychrometric Processes

- Sensible heating/ Cooling
- Mixing of air streams
- Cooling and dehumidification
- Steam injection
- Evaporative Cooling
- Chemical dehumidification (e.g. over Silica gel)
- Spray washers with heating/ cooling of water

Central air-handling unit – basic circuit



Hundy et al, 2008

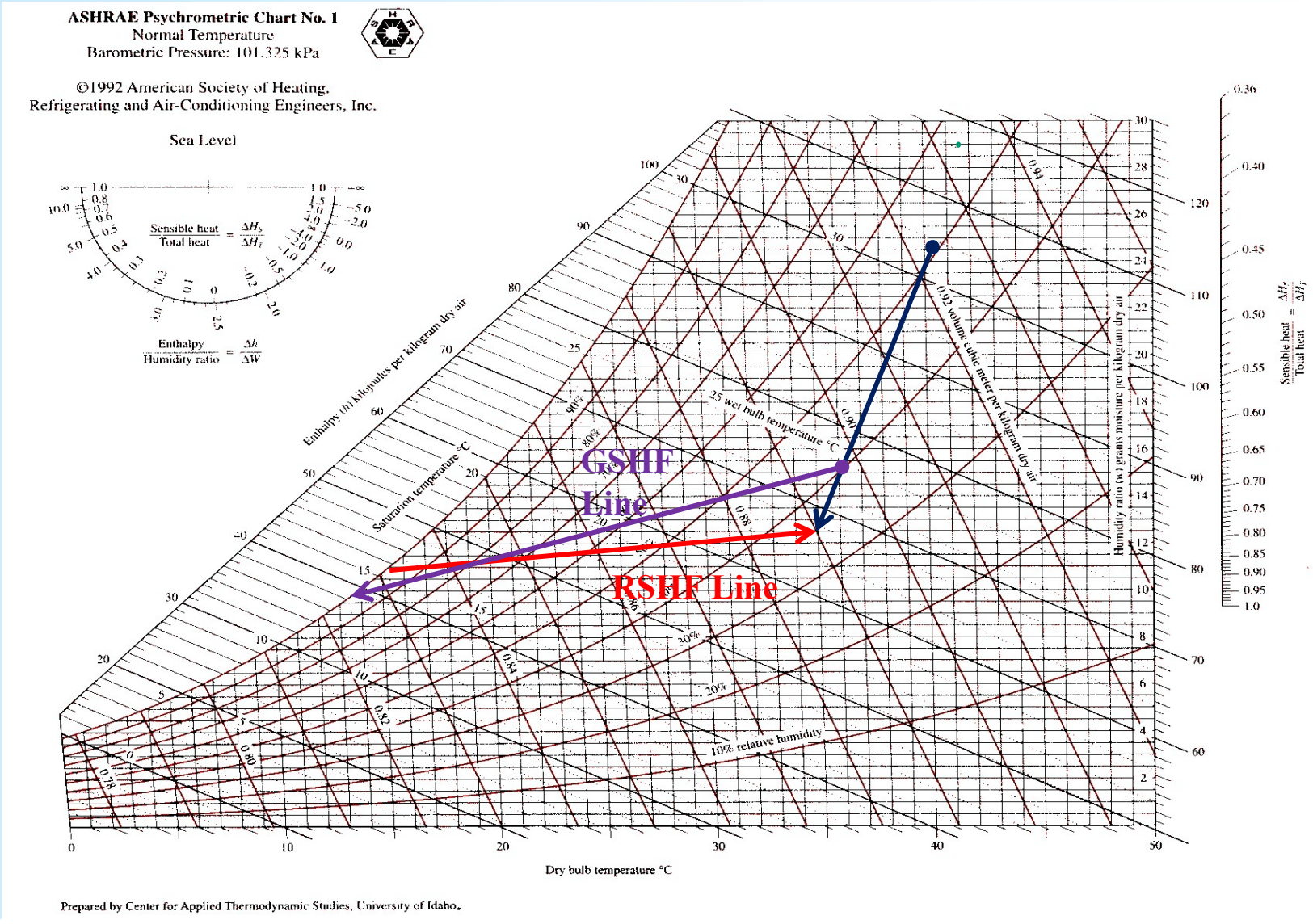
Input Parameters for design

- Outside and Inside design conditions
- % ventilation or ventilation air flow rate
- Room loads (through calculations)
  - RSHF

Important Concepts in Air-Conditioning

- Coil Condition curve
- Coil ADP
- Bypass factor
- Room sensible heat factor (RSHF)

Summer Air-conditioning with Bypass



Performance Parameters

- Mass flow rate of supply air
- Room loads (TR)
- Cooling capacity of system
- COP of system