"Temperature & Humidity Control in Surgery Rooms"

By: John Murphy

ASHRE Journal, June 2006

Presented by: Lucy Summerville

Introduction

- Goal: Control temperature and humidity in surgery rooms
- Influencing factors
  - Temperature and humidity requirements
  - High air change rates

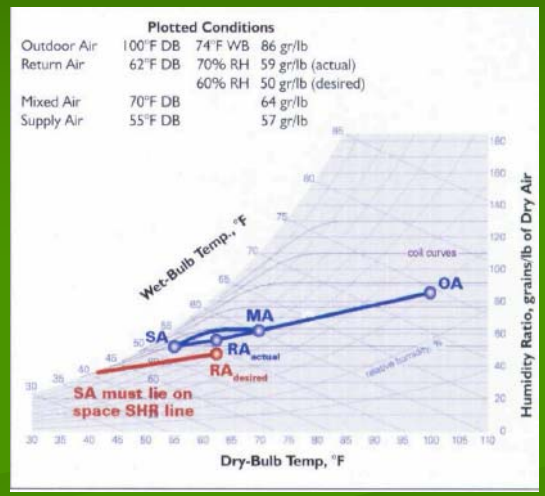
	Dry Bulb	Relative Humidity	Room ACH	Outdoor ACH	Outdoor Air
ASHRAE[1]	68°F–75°F (20°C–24°C)	30%–60%	25	5	20%
AIA[2]	68°F–73°F (20°C–23°C)	30%–60%	15	3	20%
VA[5]	62°F–80°F (17°C–27°C)	45%–55%	15	15	100%

Designs

- **Temperature only design**

$$Q_s = 1.085 \times 1{,}125 cfm \times (62^\circ F - T_{sa}) = 8{,}190 Btu/h$$

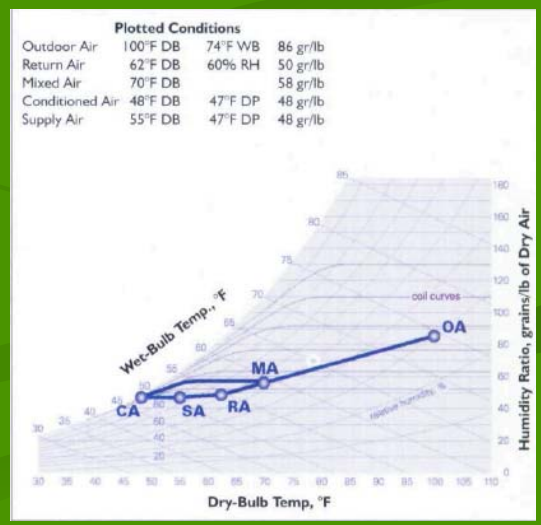
  - **Smaller ΔT (T_{sa}=55°F)**
  - **Results in Φ that is too large (Φ=70%)**



- **Temperature and Humidity design**

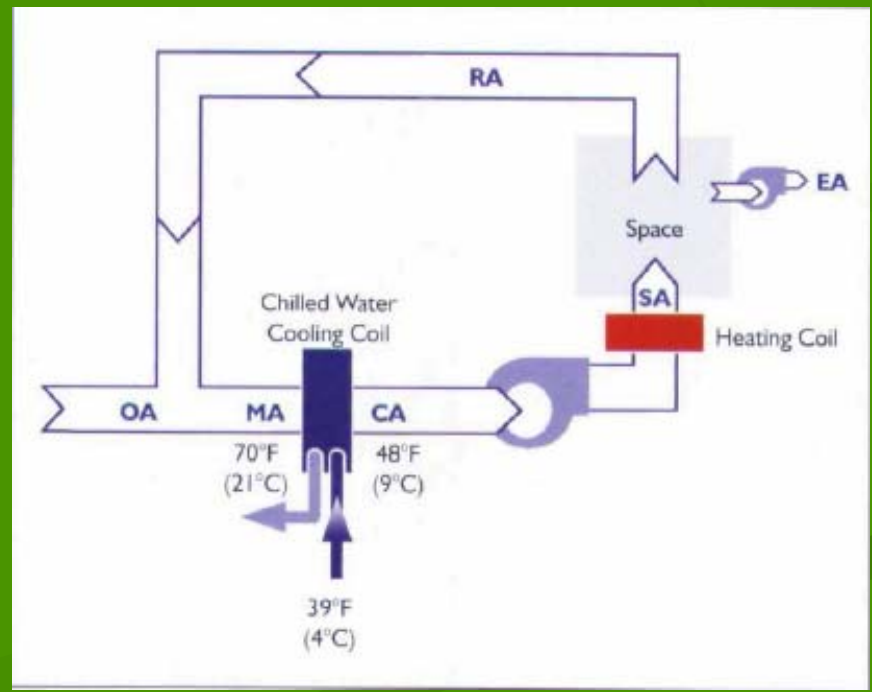
$$Q_L = 0.7 \times 1{,}125 cfm \times (50 gr/lb - W_{sa}) = 1{,}600 Btu/h$$

  - **Low humidity ratio (W_{sa}=48 gr/lb)**
  - **Will overcool room (T_{sa}=47°F)**



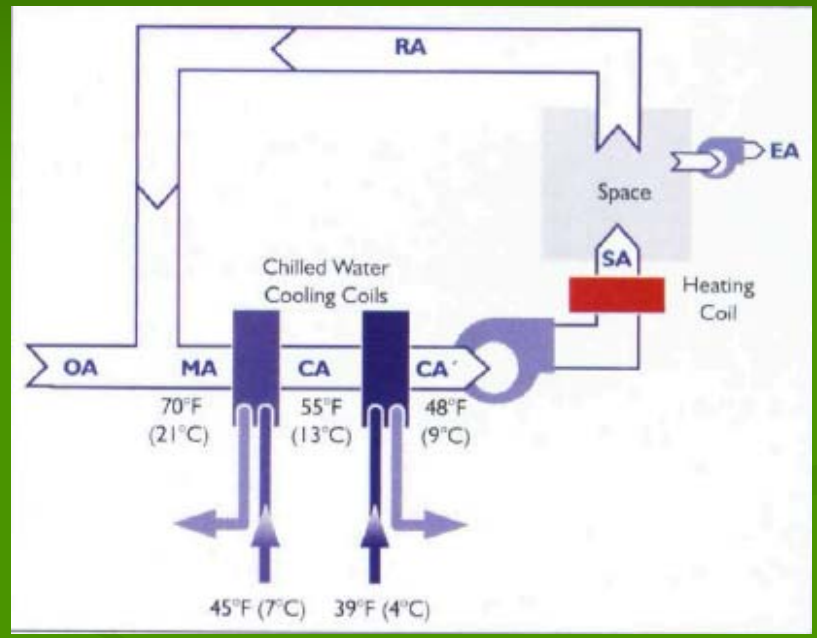
One Cooling Coil

- Reheats air to avoid overcooling
- Requires a new chiller to cool water
  - Water from existing plant may not be cold enough
  - Could be adapted to work with an existing central plant



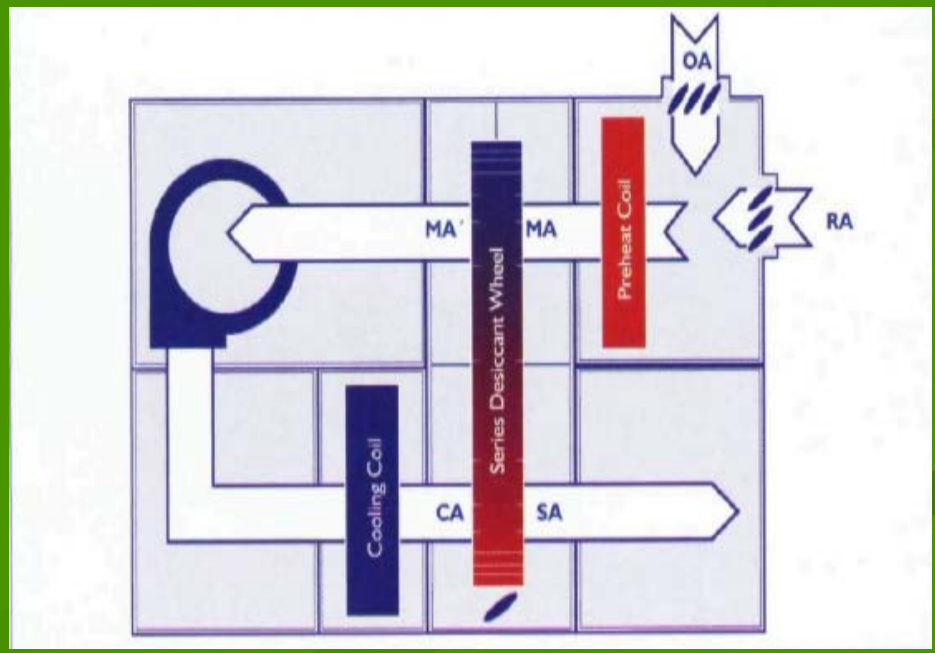
Two Cooling Coils

- Upstream coil
  - Cools and partially dehumidifies air
  - Uses existing chiller
- Downstream coil
  - Requires new chiller
  - Finishes dehumidifying air
- Advantage over single coil
  - New chiller can be smaller



Series Desiccant Wheel

- Desiccant wheel
  - Absorbs water vapor
  - Delivers drier air without affecting coil temperature
  - Has added airside pressure drop
- Benefits
  - No regeneration air stream required
  - Warmer air leaving coil



Conclusion

- Design comparisons

	Space RH	Cooling Capacity	Leaving-Coil DB	Reheat Capacity
Cool and Reheat (Single Cooling Coil)	60%	3 tons (10.6 kW)	48°F (9°C)	8,500 Btu/h (2.5 kW)
Cool and Reheat (Two Cooling Coils In Series)	60%	3 tons (10.6 kW)		8,500 Btu/h (2.5 kW)
Upstream Cooling Coil		1.8 tons (6.3 kW)	55°F (13°C)	
Downstream Cooling Coil		1.2 tons (4.2 kW)	48°F (9°C)	
Series Desiccant Wheel	55%	2.1 tons (7.4 kW)	52°F (11°C)	0 Btu/h (0 kW)

- Series Desiccant Wheel is most favorable
  - Lower Humidity
  - Sufficiently warm air
  - Compatible with existing chiller plants
  - Less overall cooling capacity