



# Systems Fundamentals

## 1. Introduction to HVAC Systems <8-hours>

- a. Dissecting HVAC Systems
  - i. Comfort Requirements
  - ii. The Five Systems Loops (Airside, Chilled Water, Refrigeration, Heat Rejection & Controls)
- b. Direct Expansion (DX) Versus Chilled Water Systems
- c. Common HVAC Systems Types: CVVT, VVCT, VRF
- d. Factors That Affect Selection of the HVAC System

## 2. Commercial Building Pressurization <3-hours>

- a. Why Control Building Pressure
- b. System Configurations
- c. Application Considerations

## 3. Improving Dehumidification in HVAC Systems <8-hours>

- a. Full Load vs. Part Load Dehumidification Performance
  - i. Dehumidification vs. Compressor Run Time
- b. Ways to Improve Dehumidification in:
  - i. Chilled-Water Terminal Systems
  - ii. Single-Zone Unitary (DX) Systems
  - iii. Central Air-Handling Systems
- c. Various Strategies Covered
  - i. Automatic Fan-Speed Adjustment
  - ii. Face-and-Bypass Dampers (& Ideal Return Air Bypass)
  - iii. Supply-Air Tempering (Reheat)
  - iv. Dedicated Conditioning of Outdoor Air
  - v. Total-Energy Recovery
  - vi. Single-Zone VAV
  - vii. Dual-Path Air Handler
  - viii. CDQ
  - ix. Colder Supply Air

## 4. The Perfect Marriage: Ice Storage + Low Temp Air Systems <5-hours>

- a. Ice Storage:
  - i. Benefits of Ice Storage
  - ii. System Components, Layout & Control
  - iii. Design Process
- b. Low Temperature Air:
  - i. Common Objections
  - ii. Benefits of Cold Air
  - iii. Impact on System Design (pros and cons)
  - iv. Cold Air Application Checklist

**Purpose:** The majority of buildings designed in North America have equipment and systems intended to meet a full load design condition and yet the majority of hours that these buildings operate are somewhere between 40-75% part load condition. With the 'Systems-Level' knowledge that you will gain from this course, you will be able to design future systems and trouble-shoot existing ones that will best balance the overall requirements at both full load and most part load conditions. You will also learn many strategies to greatly improve the amount of moisture your system will remove from the air - leaving the occupants considerably more comfortable during most part load conditions.