

ASHRAE's HVAC Design: Level I - Essentials

Instructors:

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Instructor Supplemental Content:

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AGENDA

Day 1

8:15 Sign-in

9:00 Introductions

9:15 Fundamentals

- Fan/Pump Laws
- Refrigeration Cycle
- U-Factor Calculations
- Roofs and Windows

10:15 Load Calculation

- Manual Load Calculations
 - Human Comfort, Standard 55, Thermostat Set Points, Weather Data
 - Heating Load

10:30 Break

10:45 Load Calculation (continued)

- Cooling Load
- Ventilation

12:30 Questions and Answers

12:45 Lunch 1-hr lunch

1:45 Psychrometrics

3:45 Break

4:00 Psychrometrics (continued)

4:45 System Selection

- Criteria for Selection
 - Zoning
 - Over- / Under-Sizing
 - Life Cycle Cost
 - System Integration

5:45 Questions and Answers

6:00 Wrap Up

Day 2

8:30 Sign-in

9:00 Design Process

10:00 Basic Design of Air Systems

- Building Pressurization
- Duct Design and Sizing
 - Leakage
 - Insulation
- Pressure Drop Calculations
- Diffuser Selection
- Fan Selection

10:30 Break

10:45 Basic Design of Air Systems (continued)

12:45 Questions and Answers

1:00 Lunch 1-hr lunch

2:00 Basic Design of Air Systems (cont.)

2:30 Questions & Answers

2:45 Basic Design of Hydronic Systems Only 25 minutes on this topic

- Pump Selection
- Pipe Sizing
- Pump Configurations/Arrangements
- Piping Configurations/Arrangements
- Steam Design

3:45 Break

4:00 HVAC Equipment Air Moving Equipment Only 20 minutes on this topic

- Fan Coil Units
- Air Handling Units
- Rooftop Units
- Cooling
 - Compressors
 - DX Condensing Units
 - Chillers
 - Heat Pumps (water/air cooled)
 - Cooling Towers (fluid/dry coolers)
- Heating
 - Boilers (non-condensing and condensing)
 - Indirect/Direct Gas Burners
 - Unit Heaters
 - Heating Coils (hot water/steam)
- Humidification
 - Electric
 - Gas

- Steam-to-Steam

5:45 Questions and Answers

6:00 Wrap Up

Day 3

8:30 Sign-in

9:00 HVAC Systems

- Constant Volume Systems
- VAV Systems
- DOAS
- Chilled Beams
- Variable Refrigerant Flow
- Underfloor Air Distribution
- Chiller Plant Design
- Boiler Plant Design
- Water Source Heat Pumps
- Ground Source Heat Pumps

10:30 Break

10:45 HVAC Systems (continued)

11:15 Questions and Answers

11:30 Codes and Standards

12:15 Questions and Answers

12:15 Lunch 1-hr lunch

1:15 SUPPLEMENTAL CONTENT:
Dynamic Simulation Methods in Building Design and Quality Control

Buildings are massively complex systems, with design solution space consisting of millions of possibilities. A handful of single design simulations cannot explore that space efficiently, leading to suboptimum design. The talk enriches the design fundamentals course by explaining how multi-objective optimisation is used to search a large solution space of design parameters in order to achieve zero carbon performance of a deep energy retrofit. The talk also explains how simulation can be used as a method for quality control of completed buildings. Studies have shown significant discrepancies between theoretical and measured properties of buildings requiring reconsideration of design margins.

2:15 BAS Controls

3:15 Break

3:30 Commissioning and Standard 180

4:30 Introduction to Technical Sales

5:00 Project Management

- Project Team
- Project Scheduling
- Documentation
- Multi-Disciplinary Team

5:00 Questions and Answers

6:00 Adjourn