

Competency Certificate

in

HVAC Design & Drafting

Course Outline

1. Introduction to HVAC system

2. Working of an air conditioner

- a. Reverse adiabatic cycle
- b. Evaporator
- c. Compressor
- d. Condenser
- e. Expansion valves or capillary tubes
- f. Thermostat

3. Types of compressors used in HVAC

- a. Reciprocating Air Conditioner Compressor
- b. Scroll AC Compressor
- c. Screw AC Compressor
- d. Rotary Air Conditioning Compressor
- e. Centrifugal Air Conditioning Compressor

4. Refrigerants used in Heating and Cooling system

- a. Basics of Thermodynamics
- b. Heat transfer
- c. Sensible heat
- d. Latent heat
- e. Psychrometric chart
- f. Dry bulb temperature
- g. Wet bulb temperature
- h. Relative humidity
- i. Humidity ratio
- j. Dew point

5. Heating and Air Conditioning Load calculation

I. Using E-20 form:

- a. Solar gain
- b. Transmission gain
- c. Equivalent temperature difference
- d. U values
- e. Bypass factor
- f. Ballast factor
- g. Infiltration
- h. Fresh air requirement calculation using ASHRAE 62.1 standards(10min)
- i. Tons of refrigerant
- j. CFM

II. Using HAP software

- a. Introduction to HAP Software
- b. To create weather properties
- c. Space creation in HAP
- d. System creation in HAP
 - i. Cav
 - ii. Vav
- e. Zone creation
- f. To create schedules for various application
- g. Occupant density calculation from ASHRAE 62.1 standard
- h. Duplicating the spaces
- i. Editing the spaces

6. Equipment selection

Types of Heating and Air Conditioning systems

- a. DX system
- b. VRF/VRV System
- c. Package units
- d. Roof top units
 - i. Chiller system
 - ii. Air cooled chillers
 - iii. Water cooled chillers

7. Air distribution system

- i. Air terminals
- ii. Introduction to air terminals
- iii. Manual calculation for diffusers
- iv. Manual calculation for grills
- v. Software calculation for air terminals
- vi. Selection of collar dampers
- a. Ducting
 - i. Introduction to Ducting system
 - ii. Standards used for duct design
 - iii. Duct sizing methodology
 - iv. Duct types
 - v. Duct sizing criteria
 - vi. Manual calculation for duct sizing
 - vii. Software calculation for duct sizing
 - viii. Selection of sheet metal gauge using SMACNA standards
 - ix. Calculating the overall duct weight
 - x. Static pressure calculation in ducting system
- b. Damper selection
 - i. Need for dampers in HVAC system
 - ii. Damper sizing
 - iii. VCD
 - iv. Fire damper
 - c. Duct supports
 - d. Insulation
 - i. Thermal insulation
 - ii. Acoustic insulation
 - iii. Under deck insulation

8. Variable Refrigerant Flow

- a. Introduction to VRF system
- b. Difference between single compressor and dual compressor system
- c. Piping design for VRF system

9. Hydronic Heating and Cooling

- a. *Open loop system design*
 - i. Water requirement
 - ii. Pipe sizing
 - iii. Finding the critical path
 - iv. Friction loss or head loss calculation
 - v. Pump capacity
- b. *Closed loop system Design*
 - i. Water requirement
 - ii. Pipe sizing
 - iii. Friction loss or head loss calculation
 - iv. Pump capacity

10. District Heating and Cooling

- a. Introduction to district heating and cooling
- b. Why district heating and cooling
 - I. General components
 - II. Centrifugal Pumps
 - III. Motors, Motor Controls,
 - IV. Variable-Frequency Drives
 - V. Pipes, Tubes, and Fittings
 - VI. Valves
 - VII. Heat Exchangers

11. Cold storage design

12. Ventilation design

- a. Need for ventilation
- b. Types of ventilation

13. Toilet ventilation

- a. Residential
- b. Commercial buildings
- c. Public bathrooms
- d. Exhaust air calculation
- e. Fresh air calculation

14. Commercial kitchen ventilation

- a. Hood types from ASHRAE 154
- b. Hood design from ASHRAE 154
- c. Exhaust air calculation
- d. Fresh air calculation

15. Car parking ventilation

- a. Exhaust air calculation
- b. Fresh air calculation
- c. Car parking smoke ventilation

16. Stair Case pressurization

17. Green HVAC

18. HVAC Designer check list

19. Preparing bill of quantity