1st Year

Basic Mathematics for HVAC

Subjects

Using formulas as an expression of logical sequence in solving problems.
Measuring using a ruler
Change of State formulas and application
Square footage use and explanation
Cubic footage determination
Sensible heat formulas
Basic electric formulas and terms
Substitution of symbols and numbers
Fraction theory
Reading p/t charts and Temperature / BTU graph

Basic Refrigeration

Subjects

Basic Physics
  Heat, Temperature & Heat Flow
  Matter & Energy
  Measuring Temperature / Temperature Scales
  Atmospheric Pressure
Refrigeration Cycles
  Moving Heat
  Vapor-compression cycle
  Refrigerants
  Evaporation / condensation
  Vapor-compression refrigeration cycle
  Four major components
  Pressure / temperature relationship
  Typical refrigeration systems
  Types of compressors
  Types of metering devices
  Other components / accessories of refrigeration cycle
Tools used in refrigeration work
  UA Tool List
  Other Hand Tools & Specialty Tools
    Schrader core remover, pinch-off, benders, special drivers
Introduction to Servicing AC / Refrigeration systems
  Using gauges & p/t chart
  Using leak detecting tools
  Using evacuation tools
1st Year continued

**Basic Electricity I**

Subjects

- Electrical Energy
  - Introduction / Safety
  - Electrical Charges & Magnetism
  - Basic Electrical Terms
  - Conductors / Insulators
  - Measuring Electricity
- Electrical Quantities
  - Voltage / Current / Resistance
- Types of Electricity
  - Static / DC / AC
- Electrical Circuits
  - Series / Parallel
- Using Electrical Meter
  - Voltage / Amperage / Resistance
- Principles of Electricity
  - Ohm's Law
  - Kirchhoff's Law
  - Electrical Power (Watts)
- Simple Control Circuit
  - Loads & Switches
  - Low voltage control components / Relays
  - Basic Electrical Drawings
  - Applied Electrical Circuits

**Copper Tube Soldering & Brazing**

Subjects

- Safety
- Copper Tube
- Soldering & Brazing Equipment
- Acetylene Tank Safety
- Filler Alloys & Fluxes
- Soldering copper tube
- Brazing copper tube
- Nitrogen use & Regulator Safety
- Pressure Testing for Leaks

**Health & Safety**

Subjects

Complete Job Safety & Health UA Manual - The recognition of job safety & health hazards, and a Certification in OSHA 30. Also included is important information concerning the employer’s responsibilities in accident prevention, along with an employee’s rights and responsibilities.
2nd Year

EPA Refrigerant Handling Certification Test Preparation
Subjects

Certification Procedure
  Test content outline
  Types of Certification
Refrigerants
  History
  Chemical Structure
  Types of Refrigerants
Environmental Issues
  Ozone
  Human Hazards
  EPA Regulations - Clean Air Act
Refrigerant Safety
  Three R's
    Recover / Recycle / Reclaim
  Recovery Requirements & Techniques
  Refrigerant Leaks
    Detection
    Repair Requirements
EPA Certification Test Outline - Internet EPA Site Access
Mid-term UA-EPA Certification Test

Electric II – Motors & Wiring Diagrams
Subjects

Electrical Safety
Basic Electricity Review
Electrical Wiring Diagram Types
Parts of the Wiring Diagrams
Use of Diagrams
Graphical Symbols
ANSI Standard Diagrams
Reading a Schematic Diagram
Manufacturer's Electrical Diagrams
Single Phase Motor Types
  Capacitors / Why they're used
  PSC
  Capacitor Start / Run
Motor Relays
  Current Relay
  Potential Relay
Three Phase Motors
  Voltage Unbalance
Power Supplies

Revised: March 2003
2nd Year continued

Refrigeration II - Operation & Service
Subjects

Condensers
  Evaporative type
  Water cooled
  Air Cooled

Evaporators
  Dry expansion
  Flooded

Compressors
  Reciprocating / Scroll / Rotary / Screw / Centrifugal

Reciprocating Compressors
  Construction
  Failure causes
  Tear-down

Autopsy of a Compressor (complete program)
3rd Year

Control Theory
Subjects

General Control Theory
Basic types of control systems
Definitions of Terms
Control Action
On / Off Control
   Conventional Thermostats
   Heat Anticipation
Reset control
Energy sources
Mode of control
Controllers
Dual input controls
PI controls
PID controls

Servicing & Electrical Troubleshooting
Subjects

Electrical Safety
Reading & Interpreting Wiring Schematics
Sequence of Operation
Servicing Procedures
Troubleshooting Electrical Circuits
Problem Solving

Customer Relations – Based on MSCA Program
Subjects

Customer Relations
Appearance
Work Habits
Service Procedures
Listening to the Customer
Explaining Repairs
Do's & Don'ts
3rd Year continued

Refrigeration III (Commercial)

Subjects

Expansion Devices, TXV
  Purpose
  Construction
  Operation
  Types
  Bulb Charges
  Distributors
  Servicing

Manufacturers
  Sporlan
  Alco
  Danfoss

Application of Bulb Charges
Balanced Port TEV
Electronic Expansion Valves
Head Pressure Controls
  Head Master
  ORI
  ORD
  ORO

Troubleshooting Iced Evaporators
Defrost Controls
CPR, EPR, Sorit, Orit, CDA Valves
  Operation and Adjustments

Oil Pump Operation
Troubleshooting Oil Problems
  Oil Floats
  Oil Separators

Compressor Maintenance & Service
Hill Parallel Compressor (Rack) System
  Start up
  Operation
  Electronic Expansion Valves
    EPR
    Hot Gas Valves
    Oil Failure Control
    Control Wiring

Refrigeration Piping Practices
4th Year

Natural Gas Heating
Subjects
- Properties of Natural Gas
- Combustion & Flame characteristics
- Natural Gas Burners
- Metering Natural Gas & Gas pressures
- Gas Venting
- Gas pipe pressure testing
- Pipe sizing

Hydronics
Subjects
- Types of Systems
- Definition of Terms
- System pressures & relief valves
- Filling a system
- Air in water / expansion tanks
- System Accessories
  - PRV valve / Flo-control valve
- Piping
- Pumps & GPM calculations

Mechanical / Electrical Systems & Devices
Subjects
- Transformers / VA calculations
- Motor Controllers
- NEMA Ratings
- Thermal OL Protection
- Lockout / Reset Relays
- Copeland Compressors
  - Terminal Plate Connections
  - Model Number ID
  - Electronic Motor Protectors
    - Robertshaw
    - Texas Instruments
- Scroll Compressor
- Discus Compressor
- Carlyle (Carrier) Compressors
  - 06D / 06E
- Familiarization & Service
- Capacity Control
  - Hot Gas
- Oil Failure Controls
  - Copeland Sentronic Pump / Control

Revised: March 2003
4th Year continued:

**Oil Heat**

Subjects

- Combustion Theory
- Oil Supply Systems
- Piping Systems
- Fuel Pump Units
- Types of Burners
- High Pressure Gun Type Burners
- Oil Nozzles
- Staging of Combustion

**Rigging**

Subjects

- Safety
- Knots & Hitches
- Slings Sizes & Selection
- Shackles & Pins
- Crane Signals

**On-line Class: Heat Pump Fundamentals**

Subjects

- Heat Pump Cycle
  - Review refrigeration cycle
  - Refrigerant Flow reversal
  - Piping Arrangement
- Heat Pump Classification
  - Air to Air / Water to Air
  - Geothermal (Ground Source) Heat Pumps
- Heat Pump Components
  - Coils / Compressors / Reversing Valve / Accessories
- Reversing Valve
  - How it works / operation
  - Parts of the Reversing Valve
  - Troubleshooting Reversing Valve
- Defrost Mode (Air Source HP’s)
  - Defrost controls
- Ground Source Heat Pumps
  - Types of Systems (Open or Closed Loop)
  - Refrigeration Piping Arrangements
  - Domestic Hot Water Heating
- Heat Pump Servicing Guidelines
5th Year

**AC Applications & Theory**

Subjects

- Fundamentals & Properties of Air
- Infiltration & Ventilation
- Calculating Outdoor Air
- Human comfort
- Air Distribution - Ducts & accessories
- Types of fans
- Measuring CFM & pressure
- Automatic Controls
- Computer Room Applications in HVAC

**Building Automation Fundamentals**

Subjects

- Hardware & Software
- Inputs & Outputs
- Networks and Devices
- Communications
- Programming Introduction (Basic)
- Internet Resources

**Applied Systems**

Subjects

- Centrifugal Systems
  - Expansion Devices for Flooded Evaporators
  - Centrifugal Compressors
  - Carrier 32 MP Microprocessor Control
- Screw Chiller Technology
  - Trane Helical Rotary
  - Carrier 30 GX, HX
- Honeywell W973 Control
- Honeywell W7100 Control
- Economizers
  - Sequence of Operation & Checkout
- Barber Colman HVP Type VAV Box
  - Operation & Service
- VVT System (Carrier) Overview & Familiarization
  - Understanding Electronic Controls
  - Micro Processors
  - Variable Speed Controls

Revised: March 2003
5th Year Continued

Advanced A/C Principles
Subjects
Steam Technology
Chemical dehumidification
Heat Recovery systems
Make-up air units
Economizers

Pneumatics
Subjects
Air Station
Function of Air Station
Air Filtration
Pressure Regulators
Thermostats
Controllers
Sensors
Transmitters
Receiver Controllers
Switches & Relays
Controlled Devices