Lesson 1: Liquid Ammonia Evaporator Supply Methods
Topics
- Gravity feed, liquid overfeed, pumped overfeed, dump trap, controlled pressure receiver, direct expansion, and flooded liquid chiller systems

Objectives
- Explain how refrigerant flows in a thermosyphon system and describe the requirements for a surge drum in a gravity feed system.
- List the benefits of a machine room liquid recirculation unit and benefits compared to direct expansion systems.
- Describe the various level controls used in a recirculation unit and explain how the liquid refrigerant is pumped from the recirculation unit through the evaporator coils.
- Describe how a dump trap functions and how it differs from a pumped overfeed system.
- Discuss the differences between a recirculation unit and a CPR system.
- Explain how a thermal expansion valve works and why a DX coil must have more heat transfer surface than an overfeed coil.
- Describe the liquid feed and operation of flooded ammonia shell-and-tube fluid coolers.

Lesson 2: Evaporators
Topics
- Evaporator operation and heat transfer principles; Tube design; Chillers; Air coils; Freezers; Ice makers; Specialty evaporators

Objectives
- Discuss basic details of evaporator operation, including the use of secondary coolant.
- List basic principles affecting evaporator heat transfer ability in DX and liquid overfeed systems.
- Discuss the reasons for coil fins and enhanced tube designs.
- Describe common DX and flooded liquid chillers.
- Discuss the construction and operation of evaporators used as air coils (coolers), including the benefits of penthouse installation.
- Describe the operation of various common kinds of freezers and ice makers.
- Explain how subcoolers, intercoolers, and thermosyphon oil coolers function as evaporators.

Lesson 3: Air Unit Defrost Systems
Topics
- Reasons for defrost; Hot gas, soft hot gas, electric, water, continuous glycol spray, and room air defrost; Defrost cycle initiation and termination

Objectives
- Explain why ice and frost form on a coil and discuss the problems resulting from this formation.
- Describe the basic process of defrosting by means of hot gas from the compressor discharge.
- Explain how the soft hot gas defrost system protects large industrial coils.
- Describe common defrost methods that do not use hot gas—electric, water, continuous glycol spray, and room air.
- Describe preset timer defrost methods.

Lesson 4: Evaporative Condensers
Topics
- Evaporative condenser basics and design features; Condenser selection; Condenser location; Refrigerant piping; Winter operation and capacity control; Water treatment

Objectives
- Discuss the basic differences between air-cooled, water-cooled, and evaporative condensers and discuss the main operating features of each.
- Discuss the benefits of the evaporative condenser and explain why it has the lowest condensing temperature.
- Describe the design components of an evaporative condenser and explain how they work together to provide cooling.
- Discuss both the process of condenser selection and good and bad practices in locating condensers.
- Describe proper piping and equalization practices for both single and multiple condenser installations.
- Explain the need for condenser winterization and capacity control and discuss proper water treatment to control mineral and bacterial content.
Lesson 5: Control Valves and Switches

Topics

- Safety relief, stop and shutoff, check, solenoid, hand expansion, pressure regulating, and float valves; Float valve switches and controllers

Objectives

- Discuss the relief valve safety requirements as specified by the ASHRAE 15 code.
- Explain why dual relief valves are used, describe proper positioning of the three-way diverting valve, and explain how to calculate relief valve flow capacity.
- Describe the functioning of the various stop valves used on ammonia systems and explain why angle valves are preferred.
- Describe the various kinds of check valves and solenoid valve uses in automatic control on ammonia refrigeration systems.
- Describe the operation and functions of the hand expansion valve and describe typical pressure regulating valve applications and methods by which the valve is controlled.
- Discuss system high-side and low-side float valve uses and describe the operation of mechanical float switches.
- Discuss the benefits of the newer electronic level controllers in the automatic control of liquid levels, safety alarms, and system shutdown procedures.