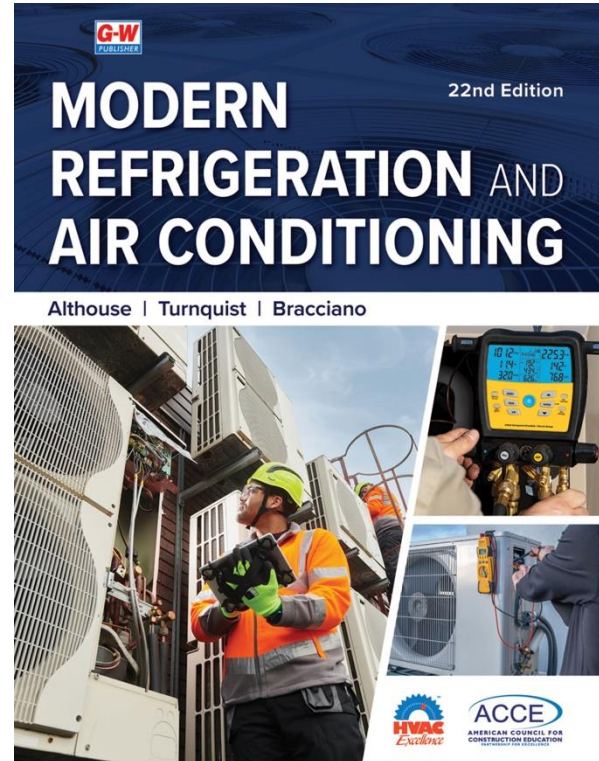


Correlation of
Modern Refrigeration and Air Conditioning, Althouse, Turnquist, Bracciano
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to
AHRI Curriculum Guide XIV. Commercial Refrigeration

Goodheart-Willcox is pleased to partner with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) and the American Council for Construction Education (ACCE) by correlating *Modern Refrigeration and Air Conditioning* to the AHRI Curriculum Guide. The following chart correlates *Modern Refrigeration and Air Conditioning* to a section of the Curriculum Guide developed by AHRI used for ACCE (formerly PAHRA) accreditation.

The chart lists the Curriculum Guide’s knowledge and task competency objectives in the left column and the corresponding chapter numbers from *Modern Refrigeration and Air Conditioning* in the right column.

For more information on the American Council for Construction Education (ACCE) and related accreditation, please visit:
www.acce-hq.org



XIV.A. Single Compressor	
Knowledge	Textbook Chapter(s)
1. Explain the importance of compressor/evaporator balance.	Chapters 32, 51, 52
2. Describe the differences in compressor displacement between the various temperature ranges.	Chapters 43, 51, 52
3. Explain basic low and high pressure control theory and operation.	Chapters 17, 19, 46, 48, 49, 50, 51, 52
4. Explain the operation of a vapor compression system and its effects on temperature and volume.	Chapters 6, 7, 8, 43, 51, 52
5. Explain the operation and components used for the pump down cycle.	Chapters 12, 45, 48, 50

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XIV.A. Single Compressor (continued)	
Knowledge	Textbook Chapter(s)
6. Explain the evaporator and the condenser side of a system.	Chapters 8, 44, 52
7. Explain application and operation of evaporator pressure regulating valves.	Chapters 8, 44, 52
8. Discuss the problems associated with compressors operating at lower evaporator temperatures:	
a. decreased volumetric efficiency	Chapters 43, 44, 45, 46, 48, 49, 50, 51, 52
b. higher discharge gas temperatures	Chapters 43, 44, 45, 46, 48, 49, 50, 51, 52
c. potential overloading during initial temperature pull-down	Chapters 43, 44, 45, 46, 48, 49, 50, 51, 52
9. Discuss the use of different compressor designs for increased efficiency and capacity.	Chapters 43, 46, 47, 48, 49, 51, 52
10. Describe the methods used for cycling the compressor on and off.	Chapters 16, 17, 19, 46, 48, 49, 50
11. Explain methods of defrost.	Chapters 44, 45, 46, 49, 51
12. Explain methods of head pressure control system.	Chapters 44, 45, 48, 49
13. Explain heat reclaim.	Chapter 44
14. Explain the lubrication methods for a compressor.	Chapters 43, 50
15. Determine the terminal identification of a single-phase compressor.	Chapters 16, 19, 43
16. Explain how to measure the compressor lubrication oil pressure.	Chapters 43, 50
17. Explain several manufacturers' model numbering system.	Chapter 16
18. Define <i>compression ratio</i> and the effect suction and discharge pressure have on compression ratio.	Chapters 43, 48, 51, 52
19. Determine compressor capacity using the compressor's curve.	Chapters 25, 52
20. Determine the correct operating amps using the compressor's curve.	—
21. Describe the different types and designs of compressors:	
Types:	
a. hermetic	Chapters 9, 43
b. semi-hermetic	Chapters 9, 43
c. open drive	Chapters 9, 43

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XIV.A. Single Compressor (continued)	
Knowledge	Textbook Chapter(s)
Design:	
a. reciprocating	Chapters 9, 43
b. scroll	Chapter 9
c. screw	Chapter 43
22. Explain requirements of food preservation:	
a. medium temperature	Chapters 41, 52
b. low temperature	Chapters 41, 52
23. Describe supermarket display cases.	Chapter 41
24. Explain the difference between an across-the-line start and a part-winding start.	Chapters 16, 17, 19
Tasks	Textbook Chapter(s)
1. Identify the different types of compressors.	Chapters 9, 19, 43
2. Select a compressor for a particular capacity and temperature range.	Chapters 9, 41, 43, 47, 51, 52
3. Check the operation of a compressor in a particular system.	Chapters 4, 13, 14, 16, 17, 19, 48, 49, 50, 52
4. Compute the compression ratio for a particular system.	Chapters 4, 11, 51, 52
5. Adjust Evaporator Pressure Regulating (EPR) valve.	Chapters 4, 44, 45, 48, 49, 50
6. Check control circuits per manufacturers' specifications.	Chapters 3, 13, 14, 15, 16, 17, 19, 48, 49, 50
7. Check system charge, superheat, and subcooling.	Chapters 4, 8, 10, 11, 12, 47, 48, 49
8. Check display case temperatures and determine if operating properly.	Chapters 4, 41, 44, 48, 49, 50
9. Set cut-in and cut-out for a special product.	Chapters 17, 19, 44, 47, 48, 49, 50
10. Draw the wiring diagrams for an across-the-line start and a part-winding start.	Chapters 13, 14, 16, 17, 19
11. Draw a ladder diagram of a system equipped with a pump down cycle.	Chapters 11, 12, 13, 14, 16, 17, 19, 44, 48, 49
12. Draw the schematic of a single-phase and a three-phase compressor motor.	Chapters 13, 14, 16, 17, 19, 47
13. Draw a ladder diagram of a system using a defrost time clock and defrost termination fan delay switch.	Chapters 13, 14, 16, 17, 18, 19, 20, 44, 45
14. Measure the compressor windings and determine if they are correct.	Chapters 13, 14, 16, 17, 18, 19, 43

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XIV.A. Single Compressor (continued)	
Tasks	Textbook Chapter(s)
15. Measure the operating amps and determine if correct.	Chapters 13, 14, 16, 17, 18, 19, 43
16. Check operation of defrost cycle and adjust time clock.	Chapters 13, 14, 16, 17, 19, 20, 43, 44
17. Adjust head pressure controls for proper operation.	Chapters 4, 11, 12, 17, 19, 44, 45, 48, 49, 50
18. Check operation of equipment equipped for automatic pump down.	Chapters 4, 12, 17, 19, 44, 45, 48, 49, 50
XIV.B. Multiplexed Evaporator Systems	
Knowledge	Textbook Chapter(s)
1. Define the different types of multiplexed systems.	Chapters 41, 44, 46
2. Explain the application of multiplexed systems.	Chapters 41, 44, 46
3. Describe how compressors are connected.	Chapters 5, 9, 43, 41, 46, 47
4. Describe the physical construction of a common rack system.	Chapters 5, 9, 43, 41, 46, 47
5. Describe the advantages of controlling capacity using the multiplexed system.	Chapters 41, 46, 47
6. Describe how compressors are cycled on and off.	Chapters 16, 17, 19, 41, 43, 46, 47
7. Explain the problems associated with multiplexed systems:	
a. oil level control	Chapters 41, 43, 46, 47, 50
b. crankcase pressure balance	Chapters 41, 43, 46
c. contamination due to a compressor burnout	Chapters 41, 43, 46, 47, 50
8. Explain the cascade system.	Chapters 41, 46, 51
9. Explain operation of evaporator pressure regulating (EPR) valves.	Chapters 44, 45, 46, 49
10. Explain function and placement of check and hot gas valves.	Chapters 41, 43, 44, 45, 46, 47, 48, 49, 50, 52
11. Explain advantages of multiple evaporator systems.	Chapters 41, 44, 45, 46, 47
12. Explain the difference in compressor requirements for a multiplexed system.	Chapters 41, 43, 45, 46, 47
13. Define the different types of multiplexed systems.	Chapters 41, 44, 46
14. Explain the difference between even and uneven parallel systems.	—

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XIV.B. Multiplexed Evaporator Systems (continued)	
Knowledge	Textbook Chapter(s)
15. Explain operation of defrost cycle.	Chapters 44, 45, 49, 51
Tasks	Textbook Chapter(s)
1. Check staging of compressors with changes in system load.	Chapters 4, 17, 19, 46, 51
2. Check individual evaporator temperatures and adjust evaporator pressure regulating (EPR) valves accordingly.	Chapters 4, 44, 45, 46, 47, 48, 49, 50
3. Identify capacity of compressors used on multiplexed system by referring to manufacturers' specifications.	Chapters 19, 51, 52
4. Set superheat on multiplex system.	Chapters 4, 11, 12, 17, 18, 19, 47, 48, 49, 51, 52
5. Check control circuits per manufacturers' specifications.	Chapters 13, 14, 16, 17, 18, 47, 48, 49
6. Adjust Evaporator Pressure Regulating valves, for established (assigned) multiple temperature cases.	Chapters 4, 10, 11, 12, 43, 44, 46, 48, 49, 50
7. Adjust pressure control to lowest temperature case.	Chapters 4, 11, 12, 43, 44, 46, 48, 49, 50
8. Layout piping diagram of multiple evaporator system showing placement of required low side components (TXVs, EPRs, CK valves, etc.) and high side required components.	Chapters 4, 5, 43, 44, 46, 47, 48, 49, 50, 52
XIV.C. Refrigerated Storage	
Knowledge	Textbook Chapter(s)
1. Explain the difference between medium temperature, low temperature, and ultra low temperature storage systems.	Chapters 41, 51, 52
2. Explain the difference between service and self-service cases.	Chapters 41, 51, 52
3. Identify service cases and self-service cases.	Chapters 41, 51, 52
4. Explain the operation of:	
a. air screen freezer	Chapter 41
b. glass door freezer	Chapter 41
c. display/coffin cases	Chapter 41

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XIV.C. Refrigerated Storage (continued)	
Knowledge	Textbook Chapter(s)
5. Explain the different methods of defrost:	
a. electric resistance	Chapters 44, 49, 51
b. hot gas	Chapters 44, 49, 51
c. cool gas	Chapters 44, 49, 51
d. natural shut-down	Chapters 44, 49, 51
e. ambient air	Chapters 44, 49, 51
Tasks	Textbook Chapter(s)
1. Replace anti-sweat heaters.	Chapters 4, 13, 14, 17, 19, 41, 50
2. Replace fan motors and fans.	Chapters 13, 14, 16, 17, 19, 30, 31, 50
3. Find and repair leaks.	Chapters 4, 11, 12, 48, 49, 50
4. Verify operation of unit.	Chapters 3, 4, 13, 14, 16, 17, 19, 41, 47, 48, 49, 50
5. Check and/or replace fan relay.	Chapters 13, 14, 16, 17, 19, 41, 47, 48, 49, 50
6. Verify airflow.	Chapters 4, 28, 44, 47, 48, 49, 50
7. Clean drain line.	Chapter 44, 50
8. Check all electrical components for voltage and current.	Chapters 13, 14, 15, 16, 17, 18, 48, 49, 50
9. Adjust operating and safety controls.	Chapters 10, 11, 13, 14, 15, 47, 48, 49, 52
10. Clean condenser coil surface (air-cooled/water-cooled).	Chapters 44, 49, 50
11. Perform all aspects of preventive maintenance.	Chapters 44, 48, 49, 50
12. Check operation of defrost cycle.	Chapters 44, 45, 46, 48, 49, 50, 51
13. Identify defrost components on a given system.	Chapters 44, 45, 48, 49, 50, 51
XIV.D. Ice Makers	
Knowledge	Textbook Chapter(s)
1. Explain the operation of ice making for both cubed and flaked ice.	Chapters 41, 48
2. Explain water spray system for ice making.	Chapters 41, 48
3. Identify styles of icemakers and explain the sequence of operation of each.	Chapters 41, 48
Tasks	Textbook Chapter(s)
1. Follow manufacturers' instructions for cleaning the evaporator.	Chapters 4, 41, 48
2. Clean the condenser.	Chapters 41, 48

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XIV.D. Ice Makers (continued)	
Tasks	Textbook Chapter(s)
3. Check the harvest cycle.	Chapters 41, 48
4. Adjust cube size.	Chapters 41, 48
5. Check for and repair leaks.	Chapters 4, 5, 11, 12, 41, 48
6. Inspect the electrical circuit.	Chapters 13, 14, 16, 17, 18, 19, 41, 48, 49, 50
7. Check and adjust the metering device for proper operation.	Chapters 4, 10, 11, 12, 41, 45, 48, 49, 50
8. Measure grid heater current when applicable.	Chapters 13, 14, 17, 19, 35, 41, 48, 49, 50
9. Clean ice storage bin.	Chapters 41, 48
10. Inspect and clean drains as necessary.	Chapters 4, 5, 41, 48, 50
11. Replace bearings and seals in flake-type machine.	Chapters 41, 48
12. Replace auger motor in a flaker.	Chapters 41, 48
13. Check and adjust water pressure.	Chapters 4, 5, 25, 41, 48, 50
14. Level the machine.	Chapters 4, 21, 41, 48
15. Check water pump.	Chapters 4, 5, 11, 41, 48
16. Check water treatment equipment.	Chapters 41, 48
17. Adjust float valve assembly.	Chapters 41, 48
18. Change float valve assembly.	Chapters 41, 48
19. Check production capacity of a given ice machine.	Chapters 41, 48
XIV.E. Dispensing Freezers	
Knowledge	Textbook Chapter(s)
1. Describe the application of dispensing freezers.	Chapter 41
2. Describe the types of dispensing freezers.	Chapter 41
3. Describe the design and construction of dispensing freezers.	Chapter 41
4. Describe the maintenance requirements of a dispensing freezer, including sanitary requirements.	Chapters 41, 48
Tasks	Textbook Chapter(s)
1. Check the operation of a dispensing freezer.	Chapters 41, 48
2. Clean and set up a dispensing freezer.	Chapters 41, 48

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XIV.F. Packaged Liquid Chillers	
Knowledge	Textbook Chapter(s)
1. Discuss the application of liquid chillers.	Chapters 25, 27, 41
2. Describe the differences in design and construction between direct expansion versus indirect expansion evaporators.	Chapters 25, 44
3. Explain the operation of liquid chillers.	Chapters 25, 27, 41
4. Discuss the problems associated with liquid chillers.	
a. insufficient water flow problems	Chapters 25, 27, 41, 48
b. considerations when operation below 32°F is required	Chapters 25, 27, 41, 48
c. added maintenance	Chapters 25, 27, 41, 48
Tasks	Textbook Chapter(s)
1. Measure the temperature drop through the chiller.	Chapters 4, 11, 25, 41, 48, 49
2. Check the operation of the liquid chiller.	Chapters 4, 11, 12, 25, 41, 48, 49
3. Identify the components of a liquid chiller.	Chapters 25, 27, 41, 48, 49
4. Determine Btu/h capacity of water chillers using flow and Delta (€) T method.	Chapters 4, 5, 11, 25, 27, 41, 48, 49, 50
XIV.G. System Applications	
Knowledge	Textbook Chapter(s)
1. Explain the operation of a single compressor/evaporator system.	Chapters 8, 41, 46
2. Explain the fundamental two-stage (multi-stage) system.	Chapters 8, 41, 46, 51
3. Explain the fundamental cascade system used for specialty ultra-low temperature application.	Chapters 41, 46, 51
4. Explain the operation of low ambient head pressure control systems (fan cycling, dampers, and flooding of condenser).	Chapters 44, 45, 48, 49
5. Explain the heat reclaim cycle (three-way valve).	Chapters 44, 45
6. Explain function operation of oil separation and return to compressor crankcase.	Chapter 43
7. Explain oil level (balance) of multi-parallel compressor applications.	Chapters 43, 46, 47
8. Explain the defrost cycle.	Chapters 44, 45, 49, 51
9. Establish the pressure control settings.	Chapters 17, 19, 45, 49

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XIV.G. System Applications (continued)	
Knowledge	Textbook Chapter(s)
10. Describe electrical/mechanical sequence from electrical schematic.	Chapters 13, 14, 16, 17, 18, 19, 41, 47, 48
Tasks	Textbook Chapter(s)
1. Adjust evaporator pressure regulating valve (EPR).	Chapters 44, 45, 48, 49, 50
2. Check control circuits as per manufacturers' specifications.	Chapters 3, 4, 13, 14, 16, 17, 19, 48, 49, 50
3. Check the suction stop valve.	Chapter 45
4. Check system for proper refrigerant charge.	Chapters 12, 47
5. Charge system with refrigerant on liquid side as well as suction side.	Chapters 12, 47
6. Test and adjust all operating and safety controls.	Chapters 4, 5, 10, 11, 12, 13, 14, 16, 17, 19, 43, 45, 47, 48, 49, 50
7. Replace filter driers.	Chapters 4, 5, 11, 12, 45, 50
8. Check compressor oil.	Chapters 43, 49, 50
9. Change oil in compressor crankcase.	Chapters 43, 49, 50
10. Check for and repair refrigerant leaks.	Chapters 4, 5, 10, 11, 12, 43, 49, 50
11. Inspect electrical circuit for defective connections.	Chapters 13, 14, 16, 17, 19, 49, 50
12. Repair defective connections.	Chapters 13, 14, 16, 17, 19, 49, 50
13. Troubleshoot from electrical schematic.	Chapters 13, 14, 16, 17, 18, 19, 49, 50
14. Check oil separator operation and return.	Chapters 43, 49, 50
15. Draw a ladder diagram of a given system.	Chapters 13, 14, 16, 17, 18, 41, 43, 45, 46, 49, 50