



Correlation of
Modern Refrigeration and Air Conditioning, by Althouse, Turnquist, Bracciano
(Goodheart-Willcox Publisher ©2021)
to
AHRI Curriculum Guide: XII. Heat Pump Systems

The following chart correlates the *Modern Refrigeration and Air Conditioning* textbook (©2021) to a section of the Curriculum Guide developed by Air-Conditioning, Heating, and Refrigeration Institute (AHRI) and used for PAHRA accreditation.

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

For more information on the Partnership for Air-Conditioning, Heating, Refrigeration Accreditation (PAHRA) and related accreditation, please visit: www.pahrahvacr.org



XII.A. Basic Principles and Components	
Knowledge	Textbook Chapter(s)
1. Review the history of heat pumps.	Chapter 40
2. Explain the basic theory of the air source heat pump system.	Chapter 40
3. Explain the basic theory of the water source heat pump system.	Chapter 40
4. Explain the basic theory of the geothermal source heat pump system.	Chapter 40
5. Identify and explain the function of the electrical and mechanical components of the heat pump systems.	Chapters 12, 13, 14, 15, 16, 32, 38, 40

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XII.A. Basic Principles and Components (continued)	
Knowledge	Textbook Chapter(s)
6. Explain terms typically used for heat pumps:	
a. Seasonal Energy Efficiency Ratio (SEER)	Chapter 40
b. Coefficient of Performance (COP)	Chapter 40
c. Heating Seasonal Performance Factor (HSPF)	Chapter 40
d. Balance Points	Chapter 40
e. Outdoor Design Temperature (ODT)	Chapter 40
f. Optimizer	Chapter 40
7. Analyze and explain the refrigerant cycle in both cooling and heating—identifying the pressure and state of the refrigerant at any point in the refrigerant circuit.	Chapters 6, 9, 31, 32, 40
8. Explain the different types of defrost methods.	Chapters 22, 23, 40
9. Describe the operation of the time clock in a defrost control.	Chapters 22, 23, 40
10. Identify which three components of a heat pump system are controlled directly during a defrost cycle.	Chapters 22, 23, 40
11. Describe a heat pump thermostat function.	Chapters 36, 40
Tasks	Textbook Chapter(s)
1. Check reversing valve for proper temperatures.	Chapters 7, 10, 11, 40
2. Calculate both economic and thermal balance points.	Chapter 40
3. Calculate temperature settings for multiple outdoor thermostats.	Chapter 40
4. Check refrigerant charge using charging chart.	Chapters 7, 9, 10, 11, 40
5. Check sequence of operation of an air-to-air split system heat pump for cooling, heating, and defrost modes.	Chapters 3, 7, 10, 11, 13, 16, 18, 40
XII.B. Applications	
Knowledge	Textbook Chapter(s)
1. Identify and describe different types of heat pump systems:	
a. air-cooled	Chapter 40
b. water-source (open loop, closed loop, air-to-water, water-to-water, and geothermal)	Chapter 40

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XII.B. Applications (continued)	
Knowledge	Textbook Chapter(s)
2. Analyze and compare the operation and performance of the different types of heat pump systems:	
a. Explain the integration and operation of the air-to-air heat pump with electric resistance heat.	Chapter 40
b. Explain the integration and operation of the water-to-air heat pump with electric resistance heat.	Chapter 40
c. Explain the integration and operation of the air-to-air heat pump with a fossil fuel unit.	Chapter 40
d. Explain applications for open vs. closed loop geothermal pump systems.	Chapter 40
Task	Textbook Chapter(s)
1. Mechanically and electrically connect and check out:	
a. Air-to-air heat pump	Chapters 7, 8, 9, 10, 11, 13, 15, 16, 18, 40
b. Water-to-water heat pump	Chapters 7, 8, 9, 10, 11, 13, 15, 16, 18, 40