Correlation of

***Modern Refrigeration and Air Conditioning,* by Althouse, Turnquist, Bracciano**
(Goodheart-Willcox Publisher ©2021)
to

HVAC Excellence Competencies Task List: Heat Pump

The following chart correlates the *Modern Refrigeration and Air Conditioning* textbook (©2021) to an area of the HVAC Excellence Competencies Task List.

The chart lists individual competency and task standards, and the corresponding chapter numbers from *Modern Refrigeration and Air Conditioning*.

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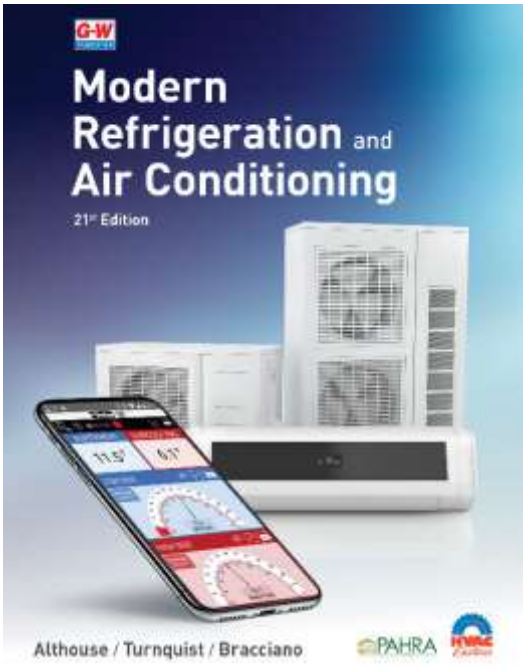

Competency / Task	Textbook Chapter(s)
Students should have prior knowledge of:	
Refrigerant thermodynamics	Chapters 4, 5, 9, 32, 40, 50
Psychrometrics	Chapter 27
Residential air-conditioning and electric heating systems	Chapters 31, 32, 40, 43
Refrigerant charging	Chapters 9, 10, 11, 40
Refrigerant recovery	Chapters 9, 10, 11, 40
Soldering and brazing techniques	Chapters 8, 40, 52
Refrigerant recycling	Chapters 9, 10, 11, 40
Refrigerant reclamation	Chapters 9, 10, 11, 40
Students must have knowledge of heat pump system components and be able to demonstrate proficiency in:	
Describing a heat pump's design configuration for both the heating and cooling cycle	Chapter 40

Correlation of *Modern Refrigeration and Air Conditioning* to
HVAC Excellence Competencies Task List: Heat Pump—page 2

Competency / Task	Textbook Chapter(s)
Defining SEER, HSPF, and COP	Chapters 15, 40, 46, 54
Identifying and differentiating between the various types of service valves	Chapters 10, 23, 40, 53, 54, 55
Differentiating between a compressor designed for use in a heat pump and one that is designed for use in a cooling-only air conditioner	Chapters 19, 40
Demonstrating the proper connection and use of a gauge manifold assembly	Chapters 10, 11, 40
Describing the operation of a reversing valve	Chapters 23, 40
Describing the procedures for testing the operation of a reversing valve	Chapters 17, 23, 32, 36, 40, 54
Performing a reversing valve replacement	
Stating the purpose of an accumulator and how it is constructed	Chapters 6, 23, 40
Evaluating and replacing an accumulator	Chapters 6, 8, 10, 11, 40
Describing the principle of operation of a capillary tube as used on a heat pump	Chapters 6, 23, 40
Describing the principle of operation of a fixed orifice as used on a heat pump	Chapters 6, 23, 40
Describing the principle of operation of a thermostatic expansion valve used with and without check valves	Chapter 40
Describing the principle of operation of an electronic expansion valve	Chapters 6, 23, 40
Evaluating and replacing a capillary tube	Chapters 6, 8, 10, 11, 21, 40
Servicing, selecting, and installing a fixed orifice	Chapters 6, 8, 10, 11, 21, 40
Servicing, selecting, and installing a thermostatic expansion valve	Chapters 6, 8, 10, 11, 21, 40
Servicing, selecting, and installing an electronic expansion valve	Chapters 6, 8, 10, 11, 21, 40
Describing a check valve, its function, and operation	Chapters 19, 20, 21, 22, 23, 40
Evaluating and replacing a check valve	Chapters 7, 8, 10, 11, 40
Describing the operation of a heat/cool relay	Chapters 36, 40
Describing the operation of the following defrost controls: mechanical, time/temperature, and solid-state	Chapters 14, 15, 16, 18, 38, 40
Describing the function of and testing method for an outdoor thermostat	Chapters 16, 36, 40
Describing the sequence of the defrost cycle	Chapter 40

Correlation of *Modern Refrigeration and Air Conditioning* to
HVAC Excellence Competencies Task List: Heat Pump—page 3

Competency / Task	Textbook Chapter(s)
Describing the sequence of operation and the testing methods for a defrost relay	Chapters 13, 16, 18, 40
Installing a solid-state defrost control	Chapters 8, 10, 13, 16, 18, 22, 36, 38, 40
Stating the purpose of and testing method for a bimetal outdoor coil temperature sensor	Chapters 7, 8, 10, 13, 16, 36, 38, 40
Evaluating and replacing a defrost board	Chapters 13, 14, 16, 18, 22
Servicing and installing a thermistor-type temperature sensor (PTC & NTC)	Chapters 7, 8, 10, 13, 14, 16, 18, 36, 38, 40
Replacing a printed circuit control board (PC) in the indoor and outdoor units	
Describing crankcase heating methods and how they operate	Chapters 11, 19, 20, 23, 40, 52, 54, 55
Describing a heat pump thermostat with emergency heat feature	Chapters 36, 40
Describing the function of and the testing method for a control circuit fuse	Chapters 13, 16, 18
Explaining how the set points for outdoor thermostats are established	Chapters 13, 16, 18, 36, 40
Describing the function and the control methods used by an indoor electronic thermostat	Chapters 13, 16, 18, 36, 40
Measuring system airflow	Chapters 27, 29, 30
Explaining the function of a liquid-line bi-flow drier	Chapters 6, 23, 40, 52, 53, 54
Installing and evaluating a liquid-line bi-flow drier	Chapters 6, 23, 40, 52, 53, 54
Installing and evaluating a liquid-line drier	Chapters 6, 23, 40, 52, 53, 54
Explaining the function of a suction-line filter-drier	Chapters 6, 23, 40, 52, 53, 54
Installing and evaluating a suction-line filter-drier	Chapters 6, 23, 40, 52, 53, 54
Identifying the types of micron gauges	Chapters 9, 10, 11, 40
Explaining the method for connecting a micron gauge to a system	Chapters 9, 10, 11, 40
Describing and performing the triple evacuation method	Chapters 9, 10, 11, 40
Describing heat pump charging procedures	
Explaining charging using the manufacturer's literature	Chapters 9, 10, 11, 40
Calculating and demonstrating the weigh-in charging method	Chapters 9, 10, 11, 40
Determining required superheat and subcooling for an operating system	Chapters 9, 10, 11, 40

Correlation of *Modern Refrigeration and Air Conditioning* to
HVAC Excellence Competencies Task List: Heat Pump—page 4

Competency / Task	Textbook Chapter(s)
Explaining charging using the superheat method	Chapters 9, 10, 11, 40
Selecting the proper refrigerant oil for an operating system	Chapters 9, 10, 11, 19, 20, 40
Explaining charging using the subcooling method	Chapters 9, 10, 11, 40
Demonstrating charging using the manufacturer's literature	Chapters 9, 10, 11
Demonstrating proper charging of HCFC and HFC refrigerants into an operating system	Chapters 9, 10, 11, 40
Demonstrating proper charging of HCFC and HFC refrigerants into an empty system	Chapters 9, 10, 11, 40
Describing the operation of and the testing method for a high-pressure switch	Chapters 13, 14, 15, 16, 18, 40, 53, 54, 55
Describing the operation of and the testing method for a low-pressure switch	Chapters 13, 14, 15, 16, 18, 40, 53, 54, 55
Describing the procedure to perform a compressor efficiency test	Chapters 51, 53, 54
Students should have knowledge of and be able to describe and demonstrate the following safety requirements:	
Ladder safety procedures	Chapter 33
Fall prevention procedures	Chapter 33
Refrigerant handling	Chapters 9, 10, 11
Nitrogen handling procedures	Chapters 8, 9, 10, 11, 25, 26, 52, 53, 54, 55
Heat pump troubleshooting and problem solving:	
Troubleshooting and problem solving involves diagnostic procedures requiring the use of test equipment, manufacturer's installation and start-up procedures, and data plate information	Chapters 7, 8, 10, 11, 13, 16, 17, 18, 19, 23, 36, 38, 40

Correlation of *Modern Refrigeration and Air Conditioning* to
HVAC Excellence Competencies Task List: Heat Pump—page 5

Competency / Task	Textbook Chapter(s)
Knowledge of the following test instruments and tools is required:	
Anemometer Thermometers (wet and dry) Gauge manifold assembly Recovery equipment Vacuum pump Micron gauge Leak detector Nitrogen cylinder Soldering and brazing equipment Charging scale and charging cylinder Refrigerant throttling valve Ohmmeter Ammeter Voltmeter Valve core removal tool Flaring tool/ tubing cutters Tubing benders Sling psychrometer	Chapters 7, 8, 10, 11, 12, 13, 17, 18, 27, 30, 40