



**Correlation of**  
***Modern Refrigeration and Air Conditioning*, by Althouse, Turnquist, Bracciano**  
**(Goodheart-Willcox Publisher ©2021)**  
**to**  
**HVAC Excellence Competencies Task List: Electrical**

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*.

For more information on HVAC Excellence and related certifications, please visit: [www.hvacexcellence.org](http://www.hvacexcellence.org).



Competency / Task	Textbook Chapter(s)
<b>Students should have knowledge of and be able to demonstrate proficiency in:</b>	
Electrical safety	Chapters 12, 13, 14, 15, 16, 17, 18
The structure of an atom	Chapter 12
Direct current	Chapter 12
Alternating current	Chapter 12
Positive and negative charged atoms	Chapter 12
Potential difference	Chapter 12
Current flow	Chapter 12
Ohm's Law and solving problems applying to Ohm's Law	Chapters 12, 13, 17, 36, 43, 54
Watt's Law	Chapters 13, 43, 44
Series and parallel circuit rules	Chapter 12
The effects of voltage drop, amps, and resistance in a series circuit	Chapters 12, 13, 15, 17, 25, 36, 40, 42, 43, 53, 54

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<b>Competency / Task</b>	<b>Textbook Chapter(s)</b>
The effects of voltage, amps, and resistance in a parallel circuit	Chapters 12, 13, 36
The effects of voltage, amps, and resistance in a combination series-parallel circuit	Chapters 12, 13, 36
Impedance and how it affects a circuit	Chapters 13, 16
Interpreting electrical diagrams	Chapter 17
Calculating and measuring the voltage output of a transformer using the number of turns on the primary vs. the secondary sides	Chapters 12, 18
Defining and identifying conductors	Chapter 12
Describing and identifying insulators	Chapter 12
Describing and identifying semiconductors	Chapters 12, 14
Identifying the types and describing the proper application and use of “circuit protectors”	Chapters 13, 14, 15, 17, 18, 20, 43
Overload protectors construction and function	Chapters 13, 15, 17, 18, 20
Evaluating, replacing, and describing the function, application, and wiring of a start capacitor	Chapters 12, 15, 18
Evaluating, replacing, and describing the function, application, and wiring of a run capacitor	Chapters 12, 15, 18
The fundamentals of single-phase and three-phase motors	Chapter 15
Defining and measuring locked rotor amps and full load amps	Chapters 15, 18
Demonstrating and explaining the purpose of checking the resistance of motor windings	Chapters 15, 18
Describing a dual-voltage three-phase motor	Chapter 15
Describing a dual-voltage three-phase motor and demonstrating the wiring configurations	Chapter 15
Describing a permanent split capacitor motor, capacitor-start induction-run motor, and a multi-speed motor	Chapter 15
Describing the operation and characteristics of motor speed drives	Chapters 15, 18
Describing and demonstrating setup and adjustment of a variable frequency drive (VFD)	Chapters 15, 17
Describing and demonstrating setup and adjustment of a variable speed drive (VSD)	Chapter 15
Describing and demonstrating the method used to change rotation direction in a three-phase motor	Chapters 15, 18

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<b>Competency / Task</b>	<b>Textbook Chapter(s)</b>
Describing and explaining motor construction, speed, and rotation for single-phase motors	Chapter 15
Describing the operation and characteristics of an electronically commutated motor (ECM)	Chapters 15, 18
Disassembling, assembling, and describing the function of the parts of an induction motor	Chapters 15, 18
Explaining the difference between a wye and delta three-phase motor	Chapters 15, 16, 18
Describing the differences between a <i>pictorial</i> , a <i>ladder diagram</i> , and a <i>schematic</i>	Chapters 13, 17
Cleaning, evaluating, and installing different types of motors (shaded-pole, split-phase, PSC, CSR, and ECM)	Chapters 12, 13, 15, 18, 30, 38, 52
Evaluating and installing a run and start capacitor	Chapters 12, 15, 18
Determining the sequence of operation using schematic wiring diagrams	Chapters 12, 13, 15, 17
Drawing and interpreting electrical diagrams for the purpose of troubleshooting	Chapters 17, 31, 32, 33, 52, 54
Installing and evaluating a transformer	Chapters 12, 13, 16
Installing and evaluating a contactor	Chapters 12, 13, 14, 15, 16, 18, 20, 23, 35, 36
Installing and evaluating a control relay	Chapters 13, 14, 16, 18, 32, 33, 36, 43, 45, 47, 49, 52, 53, 54, Appendices
Installing and evaluating a defrost timer	Chapters 13, 17, 22, 47, 51, 54
Installing and evaluating a digital thermostat	Chapters 13, 16, 18, 36
Installing and evaluating a line starter	Chapters 12, 13, 16, 18, 43
Installing and evaluating a solenoid valve	Chapters 8, 10, 11, 12, 13, 16, 18, 23, 52
Installing and evaluating start relays (current, potential, and solid-state)	Chapters 13, 16, 18, 27, 43, Appendices
Installing and evaluating temperature coefficient thermistors	Chapters 12, 13, 14, 15, 16, 18, 23, 36
Identifying electrical symbols used in HVACR schematics	Chapters 12, 16, 17, 18, 36
Identifying inoperative/defective components using schematic wiring diagrams	Chapters 12, 13, 16, 17, 18, 36
Identifying voltage between two points using schematic wiring diagrams	Chapters 12, 13, 16, 17, 18, 36
Installing and evaluating a communications thermostat	Chapters 13, 16, 18, 36

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Competency / Task	Textbook Chapter(s)
Installing, evaluating, and servicing a dual-stage thermostat	Chapters 13, 16, 18, 33, 36
Servicing and installing equipment control circuits	Chapters 12, 13, 15, 16, 18
Servicing and installing equipment power supply	Chapters 12, 13, 15, 16, 18
Identifying the types and describing the proper application and use of common switches used in HVACR	Chapters 12, 14, 16
Identifying the types and describing the proper application and use of positive temperature coefficient thermistors (PTC)	Chapters 12, 13, 14, 15, 16, 18, 23, 36
Describing and demonstrating the proper solder, flux, and procedures for soldering electrical wiring	
<b>Students should have knowledge of and be able to describe and demonstrate the following safety requirements:</b>	
Ladder safety procedures	Chapter 33
Describe and perform “lock out and tag” procedures	Chapter 53
Identifying the safety ground	Chapter 13
Identifying the “hot” conductor	Chapter 13
Identifying “neutral” conductor	Chapter 13
Electrical shock, prevention, and first aid	Chapters 12, 13, 15, 18, 43
Electrical burns, prevention, and first aid	Chapters 12, 13, 15, 18, 43
Describe and demonstrate emergency first-aid procedures	
<b>Knowledge of the following test instruments and tools is required:</b>	
Ohmmeter Multimeter Ammeter Voltmeter Wattmeter Hermetic compressor analyzer Relay tester Megger meter Capacitor analyzer	Chapters 12, 13, 16, 17, 27, 43, 53, 54