Correlation of

Modern Refrigeration and Air Conditioning, **by Althouse, Turnquist, Bracciano**

(Goodheart-Willcox Publisher ©2025)

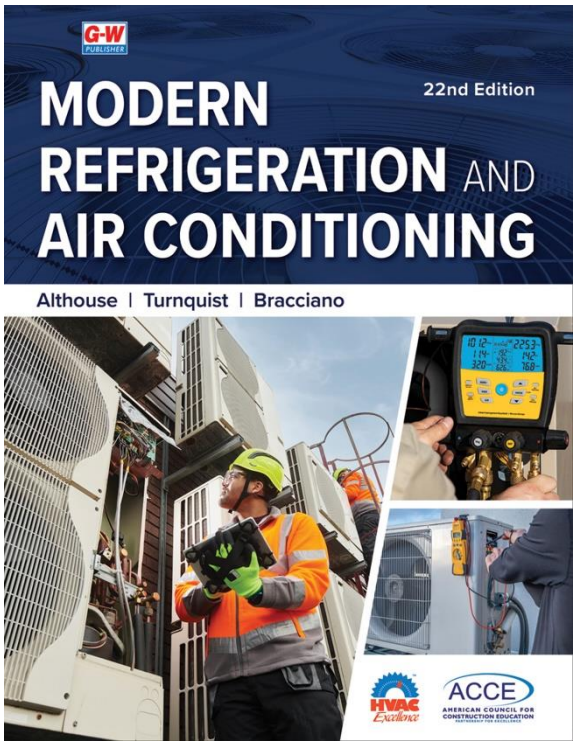
to

HVAC Excellence Competencies Task List: Electrical

The following chart correlates the *Modern Refrigeration and Air Conditioning* textbook (©2025) 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.



Competency/Task	Textbook Chapters
Students should have knowledge of and be able to demonstrate proficiency in:	
Electrical safety	Chapters 13, 14, 15, 16, 17, 18, 19
The structure of an atom	Chapter 13
Direct current	Chapter 13
Alternating current	Chapter 13
Positive and negative charged atoms	Chapter 13
Potential difference	Chapter 13
Current flow	Chapter 13
Ohm's law and solving problems applying to Ohm's law	Chapters 13, 14, 18, 23, 35, 49

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Competency/Task	Textbook Chapters
Watt's Law	Chapters 14, 35, 39
Series and parallel circuit rules	Chapter 13
The effects of voltage drop, amps, and resistance in a series circuit	Chapter13, 14, 16, 18, 21, 23, 34, 35, 39, 48, 49
The effects of voltage, amps, and resistance in a parallel circuit	Chapters 13, 14, 23
The effects of voltage, amps, and resistance in a combination series-parallel circuit	Chapters 13, 14, 23
Impedance and how it affects a circuit	Chapters 14, 17
Interpreting electrical diagrams	Chapter 18
Calculating and measuring the voltage output of a transformer using the number of turns on the primary vs. the secondary sides	Chapters 13, 19
Defining and identifying conductors	Chapter 13
Describing and identifying insulators	Chapter 13
Describing and identifying semiconductors	Chapters 13, 15
Identifying the types and describing the proper application and use of "circuit protectors"	Chapters 14, 15, 16, 18, 19, 35
Overload protectors construction and function	Chapters 14, 16, 18, 19, 43
Evaluating, replacing, and describing the function, application, and wiring of a start capacitor	Chapters 13, 16, 19
Evaluating, replacing, and describing the function, application, and wiring of a run capacitor	Chapters 13, 16, 19
The fundamentals of single-phase and three-phase motors	Chapter 16
Defining and measuring locked rotor amps and full load amps	Chapters 16, 19
Demonstrating and explaining the purpose of checking the resistance of motor windings	Chapters 16, 19
Describing a dual-voltage three-phase motor	Chapter 16
Describing a dual-voltage three-phase motor and demonstrating the wiring configurations	Chapter 16
Describing a permanent split capacitor motor, capacitor-start induction-run motor, and a multi-speed motor	Chapter 16
Describing the operation and characteristics of motor speed drives	Chapters 16, 19

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Competency/Task	Textbook Chapters
Describing and demonstrating setup and adjustment of a variable frequency drive (VFD)	Chapters 16, 18
Describing and demonstrating setup and adjustment of a variable speed drive (VSD)	Chapter 16
Describing and demonstrating the method used to change rotation direction in a three-phase motor	Chapters 16, 19
Describing and explaining motor construction, speed, and rotation for single-phase motors	Chapter 16
Describing the operation and characteristics of an electronically commutated motor (ECM)	Chapters 16, 19
Disassembling, assembling, and describing the function of the parts of an induction motor	Chapters 16, 19
Explaining the difference between a wye and delta three-phase motor	Chapters 16, 17, 19
Describing the differences between a *pictorial*, a *ladder* diagram, and a *schematic*	Chapters 14, 18
Cleaning, evaluating, and installing different types of motors (shaded-pole, split-phase, PSC, CSR, and ECM)	Chapters 13, 14, 16, 19, 31, 47
Evaluating and installing a run and start capacitor	Chapters 13, 16, 19
Determining the sequence of operation using schematic wiring diagrams	Chapters 13, 14, 16, 18
Drawing and interpreting electrical diagrams for the purpose of troubleshooting	Chapters 18, 22, 23, 25, 47, 49
Installing and evaluating a transformer	Chapters 13, 14, 17
Installing and evaluating a contactor	Chapters 13, 14, 15, 16, 17, 19, 23, 26
Installing and evaluating a control relay	Chapters 14, 15, 17, 19, 23, 25, 26, 35, 41, 46, 47, 48, 49, Appendices
Installing and evaluating a defrost timer	Chapters 14, 18, 20, 41, 44, 49, 52
Installing and evaluating a digital thermostat	Chapters 14, 17, 19, 23
Installing and evaluating a line starter	Chapters 13, 14, 17, 19, 35
Installing and evaluating a solenoid valve	Chapters 5, 11, 13, 14, 17, 19, 45, 47, 49
Installing and evaluating start relays (current, potential, and solid-state)	Chapters 14, 17, 19, 28, 35, Appendices
Installing and evaluating temperature coefficient thermistors	Chapters 13, 14, 15, 16, 19, 45
Identifying electrical symbols used in HVACR schematics	Chapters 13, 15, 17, 18, 19, Appendices

Competency/Task	Textbook Chapters
Identifying inoperative/defective components using schematic wiring diagrams	Chapters 13, 14, 17, 18, 19
Identifying voltage between two points using schematic wiring diagrams	Chapters 13, 14, 17, 18, 19
Installing and evaluating a communications thermostat	Chapters 14, 17, 19
Installing, evaluating, and servicing a dual-stage thermostat	Chapters 14, 17, 19, 25
Installing and evaluating a smart thermostat	Chapter 14, 17, 19, 23
Installing and evaluating a dual-fuel heat pump thermostat	Chapter 17, 36
Evaluating electrical panel capacity as part of electric heating additions or conversions	Chapters 18, 21, 22, 25, 26
Servicing and installing equipment control circuits	Chapters 13, 14, 16, 17, 19
Servicing and installing equipment power supply	Chapters 13, 14, 16, 17, 19
Identifying the types and describing the proper application and use of common switches used in HVACR	Chapters 13, 15, 17
Identifying the types and describing the proper application and use of positive temperature coefficient thermistors (PTC)	Chapters 15, 17, 19, 20
Describing and demonstrating the proper solder, flux, and procedures for soldering electrical wiring	Chapters 4, 5
Students should have knowledge of and be able to describe and demonstrate the following safety requirements:	
Ladder safety procedures	Chapters 2, 25
Describe and perform “lock out and tag” procedures	Chapters 2, 14, 17, 47, 48, 49, 50
Identifying the safety ground	Chapter 14
Identifying the “hot” conductor	Chapter 14
Identifying “neutral” conductor	Chapter 14
Electrical shock, prevention, and first aid	Chapters 2, 13, 14, 16, 17, 35
Electrical burns, prevention, and first aid	Chapters 2, 13, 14, 16, 19, 35
Describe and demonstrate emergency first-aid procedures	Chapter 2
Knowledge of the following test instruments and tools is required:	

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Competency/Task	Textbook Chapters
Ohmmeter Multimeter Ammeter Voltmeter Wattmeter Hermetic compressor analyzer Relay tester Megger meter Capacitor analyzer	Chapters 4, 13, 14, 15, 17, 18, 19, 21, 28, 35, 48, 49