



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

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 must have knowledge of oil heating systems, their components, and be able to demonstrate proficiency in:</b>	
Describing and explaining the function of upflow, downflow, and horizontal furnaces	Chapters 38, 42
Describing combustion theory and heating fuels	Chapter 42
Describing the properties of various heating fuels	Chapter 42
Defining Btu	Chapters 4, 41, 42, 50
Defining AFUE	Chapters 38, 41, 46
Describing and using the sensible heat formula	Chapters 4, 5, 6, 29, 50
Describing the principles of humidification	Chapter 35
Describing the principles of dehumidification	Chapter 35
Explaining the Btu content and specific gravities of various fuel oils	Chapter 42

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Competency / Task	Textbook Chapter(s)
Describing the oil pressures (and vacuum levels) on an operating oil-fired heating system	Chapter 42
Measuring the oil pressures (and vacuum levels) on an operating oil-fired heating system	Chapter 42
Measuring the flue gas temperatures of furnaces	Chapter 42
Determining the amount of combustion air required to safely burn oil in a furnace	Chapter 42
Defining primary and secondary air	Chapters 41, 42
Differentiating between primary air and excess air	Chapters 41, 42
Describing the causes of burner “flashback”	Chapter 41
Describing the causes of a lifting flame	Chapter 41
Stating the reason for appropriate polarity wiring on solid-state circuits	Chapters 13, 14, 16, 18, 42
Stating the generally accepted standard oil pressure for a residential furnace	Chapter 42
<p>Describing, explaining the function of, evaluating, cleaning, and replacing (when feasible) the following components:</p> <ul style="list-style-type: none"> <li>Oil valves used with residential furnaces</li> <li>Oil pressure regulating valves</li> <li>Orifice</li> <li>Heat exchanger</li> <li>Flue baffles</li> <li>Fuel oil pump</li> <li>Cadmium sulfide cell</li> <li>Burner primary safety control</li> <li>Ignition module</li> <li>Spark igniter</li> <li>High-voltage ignition transformer</li> <li>Flame sensor</li> <li>Combination fan and limit switch</li> <li>Door safety switch</li> <li>Blower motor relay</li> <li>Vent blower motor</li> <li>Vent pressure switch</li> <li>Vent motor relay</li> <li>Single-stage thermostat</li> <li>Dual-stage thermostat</li> <li>Run and start capacitor</li> </ul>	Chapters 12, 13, 14, 15, 16, 18, 36, 38, 42, 52
Describing a blower housing cut-off plate	Chapter 32
Identifying the different types of venting systems	Chapters 38, 41, 42
Sizing and installing the venting systems	Chapters 38, 42
Installing fuel lines	Chapter 42

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<b>Competency / Task</b>	<b>Textbook Chapter(s)</b>
Describing the purpose and operation of delayed action solenoid valve	Chapter 42
Describing the function of a barometric draft control	Chapters 38, 42
Describing the testing and adjustment procedure of a barometric draft control	Chapters 38, 42
Describing the function of and the testing method for a fuel unit cut-off	Chapter 42
Describing the procedure to perform a smoke test on an oil furnace	Chapter 42
Installing a fire-stop support plate	
Adjusting blower fan speed for proper temperature rise	Chapters 29, 38, 52
Describing the procedure for measuring static pressure	Chapters 27, 29
Sizing wires with regards to voltage drop and length of wiring run	Chapters 12, 13, 15, 18, 25, 36, 42, 43, 53, 54
Describing and demonstrating proper soldering procedures for electrical wiring	
Describing and demonstrating proper installation of a single- and two-stage thermostats	Chapters 13, 15, 16, 18, 29, 36, 42
Describing and demonstrating proper installation of a communication-type thermostat	Chapter 36
Describing the procedure for adjusting airflow on a belt-driven blower assembly	Chapters 29, 38, 52
Describing the procedure to de-rate a gas furnace at altitudes of 2,000 feet and above	Chapters 41, 42
Describing and demonstrating proper use of a combustion analyzer	Chapters 41, 42
Identifying the different types of conduit used for power	Chapter 13
Installing duct connectors and hangers	Chapter 29
Describing and demonstrating proper installation of a duct-mounted carbon monoxide detector	
<b>Students should have knowledge of and be able to describe and demonstrate the following safety requirements:</b>	
Ladder safety procedures	Chapter 33
Clearances to combustibles for venting materials	Chapters 38, 42
Flue gas testing procedures for carbon monoxide	Chapters 41, 42
Ambient air testing procedures for carbon monoxide	Chapters 41, 42
Proper safety procedures to follow on discovery of an oil leak	Chapter 42

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Competency / Task	Textbook Chapter(s)
Describe the safety procedure to be followed upon discovery of a defective heat exchanger	Chapter 42
<b>Oil heat troubleshooting and problem solving:</b>	
Troubleshooting and problem solving involves diagnostic procedures requiring the use of test instruments, data plate information, and wiring diagrams. All of the gas furnace system components, circuits, air distribution system, and/or power supply should be part of troubleshooting and problem solving.	Chapters 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 27, 30, 38, 42
<b>Knowledge of the following test instruments and tools is required:</b>	
Combustion analyzer Stack thermometers Carbon monoxide detector Ammeter Manometers Anemometer Ohmmeter Velometer Pressure gauges Voltmeter	Chapters 7, 8, 10, 11, 17, 27, 38, 42