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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fasteners, Hand and Power Tools **Prerequisite(s): None** **Estimated theory hours:** 4

Task: Identify and select fasteners.

Module 01	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
01.01.01	Identify types of fasteners	Identify fasteners in terms of: • size • applications to specific materials • strength capacity **Electrical fasteners:** ○ terminal connections (spade / ring connectors) ○ crimp connectors ○ wire nuts (marrettes) ○ soldered connectors ○ non-metallic cable connectors to electrical boxes ○ amoured cable (BX) connectors to electrical boxes **Pipe fasteners:** • pipe rings • U-bolts • grappling bar • clamps • pipe saddles • beam clamps • brackets • rod attachments • pipe hangers

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fasteners, Hand and Power Tools **Prerequisite(s): None** **Estimated theory hours:** 4

Task: Identify and select fasteners.

Module 01	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
01.01.01 continued	Identify types of fasteners: • size • applications to specific materials • strength capacity	**General fasteners:** • wood screws • bolts • hose clamp • metal screws • rawl plugs • lag bolts • drive/s - cleats • machine (bolts, nuts) • ready rod • aluminium tape • mechanical strut and clamp system (uni-strut)
01.01.02	Identify the methods of selecting correct fasteners.	Factors to select fasteners: • type of materials being used • size • type of operation to be performed • restriction of fastener used • necessary force to be applied • most efficient usage
01.01.03	Store and handle fasteners.	identify proper methods for storing and handling fasteners based on the following: • type of materials - copper, iron, aluminium
01.01.04	Describe the methods for using fasteners.	Show proper safety methods to ensure the fastener is securely and safely installed such as: ○ lead shields ○ plastic plugs ○ lag bolts ○ anchors

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fasteners, Hand and Power Tools **Prerequisite(s): None** **Estimated theory hours:** 4

Task: Identify and select hand tools.

Module 01	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
01.02.01	Identify type of hand tools specified in terms of their: • size and shape • applications to specific materials • strength capacity • operating range Determine the methods for assembling and adjusting hand tools	**General tools:** • screwdrivers • tin snips • allen keys • wire brushes • pliers • crimping tools • wrenches (open, box, adjustable) • chisels • tube benders • hammers • files • pipe wrenches • spirit levels • chalk lines • plumb bob • utility knives • measuring tape/rule/ electronic measuring tools **Cutting tools:** ○ saws (metal, wood) ○ pipe/tube cutter (back, iron, copper and plastic) **Threading tools:** • pipe dies • reamers • taps/dies • clamps • vices • flaring tools

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fasteners, Hand and Power Tools **Prerequisite(s): None** **Estimated theory hours:** 4

Task: Select and use hand tools

Module 01	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
01.02.02	Select the appropriate hand tool.	Select hand tools based on the following factors: • type of tool • size of tool • type of materials being used • dimensional restriction in which to operate • type of operation to be performed • safe operation • restricted operation • restriction of fastener used • necessary force to be applied • most efficient usage The most efficient tool to perform the following operation: ○ threading ○ holding ○ cutting ○ fastening ○ material removal
01.02.03	Store and maintain tools	Proper methods for storing and handling hand tools based on the following: • type of tool • size • type of construction • safety • cleanliness • lubrication

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fasteners, Hand and Power Tools **Prerequisite(s): None** **Estimated theory hours:** 4

Task: Identify measuring instruments.

Module 01	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
01.03.01	Determine measurement.	General overview of how to obtain these measurements: • length • diameter • volume • width • height • area • slope • circumference
01.03.02	Select and demonstrate the method for using measuring instruments	Select instruments according to: • type • size • application to: measure; align; check • measuring limitations • accuracy of instruments
01.03.03	Identify measuring instruments.	Types of measuring instruments such as: • tapes and rules • feeler gauges • straight edge • squares • thumb drills • drill gauges
01.03.04	Describe the procedures to care for measuring instruments.	• storage procedures • cleanliness

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fasteners, Hand and Power Tools **Prerequisite(s): None** **Estimated theory hours:** 4

Task: Identify and select testing instruments.

Module 01	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
01.04.01	Identify specialized tools for cleaning and servicing.	Select and use specialized tools for servicing and cleaning such as: • brushes - flue/fan/burner • vacuum cleaner • masks • extension cords • trouble lights • ladders
01.04.02	Identify procedures for proper care and storage of specialized tools for cleaning and servicing.	Storage requirements as per manufacturer's instructions

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fasteners, Hand and Power Tools **Prerequisite(s): None** **Estimated theory hours:** 4

Task: Identify power tools.

Module 01	Learning Objectives: Upon successful completion, the student will be able to:	Theory
		Content
01.05.01	Identify power tools and accessories	Power tools and accessories such as: • electric drills • electric hammers • power saws • power grinders • pipe cutting and threading machine • saw blades • drill bits • grinding discs
01.05.02	Procedures for care and protection of power tools.	Note any special procedures for care and protection of power tools and accessories
01.05.03	Select proper tools and accessories for the job.	Select tool and accessories based on the following factors: • type • size • operating range • applications • tolerances • materials to be worked on

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fasteners, Hand and Power Tools **Prerequisite(s): None** **Estimated practical hours:** 2

Performance Objective: Identify and select fasteners, hand tools, and power tools

Module 01	Practical		
	Scenario	**Procedure**	**Criteria**
01.06.01	The student will identify and select various types and sizes of fasteners.	Have student: • identify a variety of fasteners (marrettes, sheet metal screws, lead shields, lags, bolts, hose clamps, pipe hangars) • select various components as outlined and for student to identify • describe application of selected components • describe tools to be used to install fasteners	Student will correctly identify various fasteners, be able to select the correct fastener for the job required and describe any storage requirements for the tools. See evaluation sheet - sample
01.07.01	The student will identify various hand tools	Have student: • identify a variety of hand tools such as allen keys, taps, snips, files, large and small wrenches and screw drivers • describe application, how to use, how much pressure to exert etc. • describe storage requirements	Student will correctly identify various hand tools, be able to select the correct tool for the job required and describe the storage requirements for the tools. See evaluation sheet - sample
01.08.01	The student will identify various power tools.	Have student: • observe the instructor identify and explain, and demonstrate the use of various power tools such as drills, hammer drills, grinders, circular and reciprocating saws, etc. The student will: ○ identify a variety of power tools ○ describe precautions necessary ○ describe proper handling and storage of power tools	Student will correctly identify various power tools, be able to select the correct tool for the job required and describe the storage requirements for the tools. See evaluation sheet - sample

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fasteners, Hand and Power Tools **Prerequisite(s): None** **Estimated practical hours:** 2

MODULE 01

SAMPLE PRACTICAL EVALUATION CHECK LIST

TASK		YES	NO
1.	Correctly Identify anchor required for light use in drywall or hollow walls	□	□
2.	Correctly Identify anchor required for heavy use in drywall or hollow walls	□	□
3.	Correctly identify anchor required for use in concrete walls	□	□
4.	Correctly identify type of bolt required to secure to heavy, thick wood	□	□
5.	Correctly Identify type of bolt used to suspend tubing in perforated strapping	□	□
6.	Correctly Identify type of hanger used to suspend copper pipe	□	□
7.	Correctly Identify type of hanger used to suspend black iron pipe	□	□
8.	Correctly identify fastener required to secure plastic drain tubing to copper or steel pipe .....:.....	□	□
9.	Correctly identify correct size of marrette to Join 2 - #14 wires	□	□
10.	Correctly identify correct size of marrette to Join 2 - #12 wires	□	□
11.	Correctly Identify type of screw required to install a sheet metal patch	□	□
12.	Correctly identify type of screw required to Install a thermostat on a drywall wall	□	□
13.	Correctly Identify size and type of screwdriver for screw A	□	□
14.	Correctly Identify size and type of screwdriver for screw B	□	□
15.	Correctly identify size and type of screwdriver for screw C	□	□
16.	Correctly identify size and type of screwdriver for screw D	□	□
17.	Correctly Identify size and type of screwdriver for screw E.....	□	□
18.	Correctly Identify size and type of screwdriver for screw F.....	□	□
19.	Correctly Identify size and type of screwdriver for screw G	□	□
20.	Correctly identify the size and type of tap required to thread a particular hole.....:.....	□	□
21.	Correctly identify the type of file required to remove a small burr	□	□

Module Title: Fasteners, Hand and Power Tools **Prerequisite(s): None** **Estimated practical hours:** 2

MODULE 01

SAMPLE PRACTICAL EVALUATION CHECK LIST

TASK		YES	NO
22.	Correctly identify the snips required to make a left-hand cut	□	□
23.	Correctly identify the snips required to make a right-hand cut	□	□
24.	Correctly Identify the snips required to make a straight cut	□	□
25.	Correctly identify the snips required to make a cut in heavy steel	□	□
26.	Correctly Identify the Allen key required to remove a particular set screw	□	□
27.	Correctly identify the wrenches required to tighten flare nuts on 1/4" copper tubing	□	□
28.	Correctly identify the wrenches required to tighten flare nuts on 7/8" copper tubing	□	□
29.	Correctly Identify the wrenches required to Install a 3/4" elbow on black iron pipe	□	□
30.	Correctly identify the bit required to drill into concrete	□	□
31.	Correctly identify the bit required to bore a 3/4" hole through thick wood	□	□
32.	Correctly identify the bit required to drill a 1/4" hole through light steel	□	□
33.	Correctly Identify power tool required to a drill hole into high strength concrete	□	□
34.	Correctly identify the type of tool required to cut apart an oil tank	□	□
35.	Correctly Identify the type of hammer required to drive nails into wood	□	□
36.	Correctly identify the type of tool required to cut and strip electrical wires	□	□
37.	Correctly identify the type of tool required to crimp and electrical crimp-on connector	□	□

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Protect Self and Others **Prerequisite(s): Module 1** **Estimated theory hours:** 4

Task: Apply safety measures in plant, shop, and vehicle

Module 02	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
02.01.01	Identify the rights and responsibilities of workers and others under various acts and codes and be aware of safety associations.	Acts and Codes such as: • Occupational Health and Safety Act • Construction Safety Association • Industrial Accident Prevention Association • Workplace Hazardous Materials Information System etc. Discuss key safety factors to be considered on the job: • **Personal** o knowledge of personal safety o protection equipment for eyes, ears, head, feet, heads, lungs, muscles, bones, skin o awareness • **Site** o knowledge of site hazards o knowledge of hazardous materials such as asbestos, chemical and biological hazards o knowledge of site protections such as housekeeping, warning signs, barricades, emergency exits o knowledge of safety equipment and its locations o knowledge of intended use of sites • **Tools:** o knowledge of protection, maintenance - housekeeping and repairs and safety o knowledge of what they are for and the proper use - mechanical and electrical o knowledge of proper use of tools - instructions and training o awareness of flaws/faults or unusual actions from tools that could indicate the need for repair or adjustment

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Protect Self and Others **Prerequisite(s): Module 1** **Estimated theory hours:** 4

Task: Apply safety measures in plant, shop and vehicle

Module 02	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
02.01.01	Identify the rights and responsibilities of workers and others under various acts and codes and be aware of safety associations. (Continued)	• **Others:** ○ knowledge of the next technician to work at site ○ knowledge of other contractors or trades persons on the site ○ knowledge of occupants at work site either living or working (residential, commercial, industrial) ○ keeping others safe after you leave the site • **Equipment** ○ knowledge of how equipment should work safely ○ maintenance - ensure equipment will continue to operate safely ○ awareness of unusual equipment actions that may indicate repair or adjustment to remain safe • **Occupational Health and Safety Act** ○ awareness of requirements on the job site ○ working knowledge of the Act ○ safe practices ○ clearances from combustibles

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Protect Self and Others **Prerequisite(s): Module 1** **Estimated theory hours:** 4

Task: Apply safety measures in plant, shop and vehicle

Module 02	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
02.01.02	List rules of safe conduct and give reasons for each rule.	Rules of safe conduct such as: • no horseplay • respect for self and others safety • warning others of unsafe conditions • reporting of unsafe conditions • maintaining good housekeeping practices in work areas • no smoking near flammable or combustible materials or gases • no use of alcohol or impairing drugs • mental health awareness

02.01.03	List good housekeeping practices and give reasons for each.	**Material Storage**
		• Workplace Hazardous Material Information System
		  ○ knowledge of potential hazardous material in the workplace
		  ○ proper storage and labelling of same
		  ○ describe what a Safety Data Sheet is
		  ○ clear walkways in storage areas
		Disposal:
		• hazardous materials disposal
		• transportation of dangerous goods
		Maintenance of Work Areas
		• review all good housekeeping practices.
		• describe sources for slips, trips and falls such as:
		  ○ oil spills
		  ○ insufficient lighting
		  ○ open pits/holes/trenches
		  ○ unsecured power cords

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Protect Self and Others **Prerequisite(s): Module 1** **Estimated theory hours:** 4

Task: Apply safety measures in plant, shop and vehicle

Module 02	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

02.01.04	Report hazards and accidents to comply with regulations.	• Workers Compensation reporting requirements
		  ○ accident reports
		  ○ OHSA hazards
		  ○ incident reporting
		• TSS Act and regulations reporting requirements
		  ○ incident reports as per Section 21 of the Fuel Oil Regulation 213/01
		  ○ unacceptable conditions as per Sections 22, 23, 24 of the Fuel Oil Regulation

02.01.05	State the established procedures for lifting and handling materials and equipment	• proper manual lifting procedures • results of incorrect lifting practices injuries to self and others) • lifting aids (lifting straps, manual jacks, etc.) • transportation of materials • tie down procedures

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Protect Self and Others **Prerequisite(s): Module 1** **Estimated theory hours:** 4

Task: Apply safety measures on the job site

Module 02	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
02.02.01	Describe correct use of equipment and tools on the job site.	• used for use intended by the manufacturer (the right tool for the right job) • read instructions and safety labels and warnings before use
02.02.02	List the factors that make up good housekeeping on the job site.	• clear debris and return useful materials to storage to prevent creation of a hazard • remove or protect protruding sharp objects • pile or stack good to avoid tipping, collapsing or rolling • store combustible, corrosive or toxic substance in a suitable container • store gas cylinders upright • only use approved containers for flammable liquids • post hazard signs • ensure adequate lighting • ensure adequate ventilation
02.02.03	List the rules for safe handling of ladders and scaffolds on the job site.	• review proper ladder angles • securing of extension ladders • powerlines and other hazards to ladder use • metal ladders and electrical equipment • ladder maintenance and specifications • wind and ladders • review OHSA scaffolds construction regulations

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Protect Self and Others **Prerequisite(s): Module 1** **Estimated theory hours:** 4

Task: Apply safety measures on the job site

Module 02	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

02.02.04	Recognize hazardous situation on the job site.	Hazardous situations:
		• debris
		• spills
		• chemicals
		• environment
		• biological
		• hazardous materials such as
		  ○ asbestos
		  ○ electrical
		  ○ processes

02.02.05	Apply mechanical and electrical lock out procedures	• purpose of lock out devices are required • review lock out equipment • review lock out methods • review potential hazards if lock outs are not used

02.02.06	Describe personal safety measures when working on sites where welding is being performed	• wear eye protection
		• do not look at the arc
		• wear protective clothing if required
		  ○ gloves
		  ○ aprons
		  ○ boots

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Protect Self and Others **Prerequisite(s): Module 1** **Estimated theory hours:** 4

Task: Interpret occupational health and safety act and regulations.

Module 02	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
02.03.01	State the major responsibilities of employers as set out in health and safety legislation.	Review appropriate sections of OHSA
02.03.02	Name the major safety and health responsibilities	Review appropriate section of OHSA for responsibilities of: • workers • supervisors • inspectors
02.03.03	Identify the regulations pertaining to hazards that may be encountered by Oil Burner Technicians	Review responsibilities of the installer as they pertain to the safe installation and operation of equipment
02.03.04	Explain the procedures in reporting an accident to comply with the Worker's Compensation Act	Accident reporting procedures following Workers Compensation Board rules: • employers' reporting obligations • workers' reporting obligations

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Protect Self and Others **Prerequisite(s): Module 1** **Estimated theory hours:** 4

Task: Apply fire safety practices

<table>
<tr><th rowspan="2">Module 02</th><th rowspan="2">Learning Objectives: Upon successful completion, the student will be able to:</th><th>Theory</th></tr>
<tr><th>Content</th></tr>
<tr><td>02.04.01</td><td>Identify the common fire hazards found in industry.</td><td>• explosion hazards
• electrical wiring hazards
• open flames
• dust / fumes</td></tr>
<tr><td>02.04.02</td><td>Identify types of fires and the proper class of fire extinguisher to employ</td><td>CLASS | TYPE OF FIRE | EXTINGUISHER ID
A | ordinary combustibles (trash, wood, paper) | Triangle containing the letter “A”. If coloured, the triangle is coloured green.
B | flammable liquids | Square containing the letter “B”. If coloured, the square is coloured red.
C | electrical equipment | Circle containing the letter “C”. If coloured, the circle is coloured blue
D | combustible metals | Five-pointed star containing the letter “D”. If coloured, the star is coloured yellow.
Extinguishers suitable for more than one class of fire should be identified by multiple symbols placed in a horizontal sequence.</td></tr>
<tr><td>02.04.03</td><td>Identify the proper procedure for extinguishing a small fire with a portable fire extinguisher</td><td>• Operation of a portable fire extinguisher
• Approved/recommended methods for fighting each of the four classes of fires
• Things to consider before using a portable fire extinguisher:
○ Is training adequate? – (confidence in success)
○ Size and nature of fire
○ Escape routes for self and others
○ Company policies and procedures
○ When and how to call the fire department</td></tr>
</table>

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Protect Self and Others **Prerequisite(s): Module 1** **Estimated theory hours:** 4

Task: Identify personal safety equipment

Module 02	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
02.05.01	Identify and demonstrate an understanding of the use of personal protective equipment required for OBT work	Demonstrate an understanding of the use of personal protective equipment for all categories of protections • ladders • tie offs • hearing protection • safety glasses • protective head wear • goggles • gloves • safety boots • protective clothing • respirators • fall arrestors and harnesses • safety hats

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Protect Self and Others **Prerequisite(s):** Module 1 **Estimated hours: 2**

Performance Objectives: Identify the appropriate PPE for various tasks

Module 2	Practical		
	Scenario	**Procedure**	**Criteria**
02.06.01	The student will identify what PPE is required for various OBT-3 activities and demonstrate an understanding of how the PPE is employed as well as the care and maintenance of PPE	The instructor will display a variety of PPE – some of which should be damaged and unusable. The student will be asked to select the appropriate and undamaged PPE for the following tasks and explain the proper use and maintenance of the selected PPE: • Cleaning an oil-fired appliance • Cutting and threading pipe • Installing fill and vent pipes at a residential tank installation • Lifting heavy loads • Drilling through a concrete wall • Working at a construction site • Cleaning up a small oil spill • Disconnecting, cleaning, and reconnecting a vent connector • Changing an oil filter • Checking an appliance disconnect switch for power • Cleaning a unit heater that is 3m (10 ft) above grade level • Cutting sheet metal • Other tasks as identified by the instructor	Students must be able to: • select the appropriate PPE for each task • provide a brief explanation of how the PPE is used • provide a brief explanation of the care and maintenance of the selected PPE • identify damaged, unusable PPE

PARTNERING FOR A SAFE ONTARIO

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Properties, Characteristics and Safe Handling of Fuel Oil **Prerequisite(s)**: None **Estimated hours:** 4

Task: Explain the sources, composition, and refining processes for the various types of fuel oil, diesel, biofuel, and renewable diesel.

Module 03	**Learning Objectives: Upon successful completion, the student will be able to:**	**Theory**
		Content
03.01.01	Describe the sources, composition, and refining processes for the creation of the various types of fuel oil, diesel, biofuel, and biodiesel	Sources of fuel oil and diesel • crude oil • bitumen • recycling/re-refining of used oil Sources of biofuel, and biodiesel • vegetable oil, animal fats, greases, and algae • a mono-alkyl ester produced via transesterification Sources of renewable diesel • a hydrocarbon produced most often by hydrotreating and also via gasification, pyrolysis, and other biochemical and thermochemical technologies Composition of fuel oil • 85% to 90% carbon; 10% to 15% hydrogen • minor amounts of sulphur, water, sediment • three types of hydrocarbon molecules: straight-chain, branch-chain, closed chain Refining process for crude oil • distinction between distillate fuels and residual fuels • distillation and catalytic processing • refining processes to achieve standardized grades of fuel Types of fuel oil and their uses • 1-K kerosene for unvented appliances • 2-K kerosene for vented vaporizing pot burners • No. 0 for far north installations (rarely encountered) • No. 1 for vaporizing pot burners and sometimes mixed with No. 2 fuel oil in winter • No. 2 for atomizing burners and engines • Diesel Types A and B for stationary engines • Brief overview of No. 4, No. 5, and No. 6 fuel oils for industrial uses Types of biofuel and their uses • B5 to B20 for mixing with distillate fuel oils • B100 standards for refining but not approved for use in appliances

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Properties, Characteristics and Safe Handling of Fuel Oil **Prerequisite(s)**: None **Estimated hours:** 4

Task: Explain the properties of fuel oil and biofuel.

Module 03	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
03.02.01	Describe the properties of kerosene, No. 1 and No. 2 fuel oil, diesel, biofuel, and biodiesel	Physical Properties • viscosity • specific gravity/density • heat content • flash point • fire point • upper and lower limits of flammability of fuel oil vapours • pour point • cloud point • sulphur content • bottom sediment and water • colour (natural and dyed) and odour • electrical conductivity • ignition quality • additives • shelf life Identify the effect of temperature changes on the properties of kerosene, No. 1 & No. 2 fuel oil, diesel, biofuel, biodiesel, and renewable diesel

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Properties, Characteristics and Safe Handling of Fuel Oil **Prerequisite(s)**: None **Estimated hours:** 4

Task: Explain the safe handling requirements for working with fuel oil

Module 03	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
03.03.01	Describe the requirements for the safe handling of fuel oil, biofuel, and biodiesel .	With reference to the Safety Data Sheets for No. 2 fuel oil / diesel biofuel, and biodiesel, review: • WHMIS classification • Health hazards related to inhalation, ingestion, eye contact, chronic and acute toxicity • First aid measures related to inhalation, ingestion, eye contact, and skin contact • Preventative and corrective measures including personal protective equipment, ventilation equipment, handling/storing, responding to land spills and water spills • Fire and explosion hazards and response
03.03.02	Describe the regulatory requirements for reporting spills and leaks for fuel oil, biofuel, and biodiesel .	B139 Definitions of: • Leaks • Spills When and how to inform the Ministry of Environment and TSSA about spills and leaks • Reportable quantity and location of escaped product as per current directives from M.O.E. and TSSA • Contact the Spills Action Centre at 1-800-668-6060 Clean-up requirements • Brief overview of the amended Annex in the B139.1.0 Code entitled “Operations – Environmental responsibilities” as well as the TSSA Advisory entitled *“Guidelines for Responding to Fuel Oil Spills and Leaks”* as applicable to an OBT-3’s role

PARTNERING FOR A SAFE ONTARIO

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Properties, Characteristics and Safe Handling of Fuel Oil **Prerequisite(s)**: None **Estimated hours:** 2

Performance Objectives: Identify the characteristics of various fuel oil and how to respond to spills

Module 3	Practical		
	Scenario	**Procedure**	**Criteria**
03.04.01	Properties of fuel oil. These exercises can be conducted as instructor experiments / demonstration or by means of a video presentation. Some of these experiments or exercises may be conducted by students if safety issues are considered. Instructor should quiz students during or after demonstration/video to determine their understanding of the fuel oil properties	The demonstration or video will show: • The colour of kerosene, No. 1, No.2 (marked and unmarked), diesel, and biofuel. • viscosity of room temperature and cold fuel oil • wax formation in cold fuel oil • water separation in fuel oil • difficulty of igniting liquid fuel oil • flame characteristics of a properly and improperly set-up pot burner • flame characteristics of a properly and improperly set-up atomizing burner	Students must be able to: • identify the various colours of fuel oil types presented • explain the change in viscosity due to temperature and the implications of those changes for oil installations • explain why wax crystals form in cold oil and the implications of wax formation for oil installations • explain why water sinks to the bottom of oil and the implications of this for oil installations • explain why an improperly set up oil burner produces soot
03.04.02	Cleaning up fuel oil spills. These exercises can be conducted as instructor experiments / demonstration or by means of a video presentation. Some of these experiments or exercises may be conducted by students if safety issues are considered. Instructor should quiz students during or after demonstration/video to determine their understanding of fuel oil spill response and reporting.	The demonstration or video will show: • A minor spill of fuel oil on concrete and the types of clean-up procedures that will successfully mitigate the spill effects. • The instructor will show a video of or describe a major fuel oil spill/leak and describe the reporting and clean-up procedures that apply to major spills	Students must be able to: • identify the procedures and equipment that would prevent a minor spill of fuel oil at a residential customer's site • explain the best method for cleaning up a minor oil spill • explain the reporting requirements for a major spill • explain the hazards associated with major oil spills

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Installation Codes, Acts and Regulations. **Prerequisite(s):** None **Estimated hours**: 8

Task: Demonstrate an understanding of the codes and acts that affect the installation of fuel oil.

Module 04	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
04.01.01 continued	Identify the governing bodies and agencies that regulate the installation of fuel oil and specify their corresponding responsibilities. continued	ULC - Underwriter's Laboratories of Canada • Organization accredited to certify and test appliances, equipment, components and accessories to an applicable approved standard. This organization is also accredited to develop standards. UL - Underwriter's Laboratories Inc. • Organization accredited to certify and test appliances, equipment components and accessories to an applicable approved standard. A product certified by UL for Canada will bear the marking "cUL". LC – LabTest Certification Inc. • Agency accredited to test appliances, equipment, components and accessories to an applicable approved standard. OTL - Omni-Test Laboratories Inc. • Agency accredited to test appliances, equipment, components and accessories to an applicable approved standard. A product certified by OMNI for Canada will bear the marking "cOTL". PSF Corporation (operating as PFS TECO) • Agency accredited to test appliances, equipment, components and accessories to an applicable approved standard. A product certified by PSF for Canada will bear the marking "cPSF". TC - Transport Canada (CTC Prior to 1991) • Federal Ministry that overviews the transportation of dangerous goods through Canada and approves propane cylinders and tanks on oil delivery trucks.

OIL BURNER TECHNICIAN CURRICULUM

Module Title: Installation Codes, Acts and Regulations. **Prerequisite(s):** None **Estimated hours**: 8

Task: Demonstrate an understanding of the codes and acts that affect the installation of fuel oil

Module 04	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

04.02.01	Describe the scope of the TSS Act and Regulations.	Overview of the TSS ACT, 2000 as amended
		• Definitions of “authorization” and “authority having jurisdiction”
		• Requirement to obtain an authorization before carrying out the activities requiring an authorization or before operating or otherwise dealing with any thing requiring an authorization.
		• Powers of a Director
		• Compliance and safety orders
		• Powers of an inspector
		• Offences and penalties
		Overview of Fuel Oil Regulation O/Reg. 213/01
		• Definition of “approved”
		• Application of Regulation
		• General requirement for compliance
		• Certificates required for various activities
		• Responsibilities of distributors, contractors, certificate holders, and owners/users
		• Equipment approval requirements
		• Response procedures for unacceptable conditions (immediate & non-immediate)
		• Dangerous occurrences (reporting to TSSA)
		Overview of Fuel Industry Certificates Regulation O/Reg. 215/01
		• Requirements and qualifications for certification
		• Scope of certificates
		  ○ Detailed coverage of the OBT-3 scope with requirement for supervision with limited allowance for general supervision with sign-off document
		  ○ Detailed coverage of scopes for OBT-1, OBT-2, OP, OBAT and construction heater certificates
		• Certificate renewal and reinstatement requirements
		• Exemptions from certification
		Brief overview of the Petroleum Industry Certificates Regulation 216/01

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Installation Codes, Acts and Regulations. **Prerequisite(s):** None **Estimated hours**: 8

Task: Demonstrate an understanding of the codes and acts that affect the installation of fuel oil.

Module 04	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
04.03.01	Describe the scope of the current B139 installation code for oil-burning equipment as amended by the Fuel Oil Code Adoption Document Amendment.	Describe how the TSSA Fuel Oil Code Adoption Document Amendment accepts and amends the National B139 Code for use in Ontario Scope of the B139 Code • installation of appliances, equipment, components, and accessories where oil is used for fuel purposes in applications that include: (a) space heating; (b) service water heating; (c) power generation; and (d) process application. • provides minimum requirements for installing or altering all stationary and portable oil-burning equipment. • provides minimum requirements for installing or altering ancillary equipment including piping and tubing systems; pumps, control devices, venting systems, accessories, heat distribution systems that affect the proper operation of the oil-burning equipment, central oil distribution systems and underground supply tanks, aboveground outdoor tanks, and aboveground tanks installed inside of buildings. • requirements for maintenance of most commonly used types of oil-burning equipment. Exclusions the scope of the B139 Code • marine or pipeline terminals • process equipment installed in refineries • appliances installed in park model trailers, recreational vehicles, and marine craft • portable devices such as lamps, blowtorches, melting pots, and weed burners • integral fuel tanks of 45 L (10 gal) capacity or less on internal combustion engines • portable oil-burning equipment within the scope of CAN/CSA-B138.1/ B138.2 Legal requirement to comply with code requirements • Legal requirement to comply with code requirements with a “shall” statement unless otherwise allowed by the authority having jurisdiction • Code requirements using the terms “may” and “should” are recommendations

OIL BURNER TECHNICIAN CURRICULUM

Module Title: Installation Codes, Acts and Regulations. **Prerequisite(s):** None **Estimated hours**: 8

Task: Demonstrate an understanding of the codes and acts that affect the installation of fuel oil

Module 02	**Learning Objectives: Upon successful completion, the student will be able to:**	**Theory**
		Content
04.03.02	Locate sections from the code as they apply to work performed by an OBT	Current B139 Installation Code for Oil-burning Equipment as amended • Scopes of each of the four parts of the B139 Code • Definitions, abbreviations, and reference publications • General requirements • Fuel-containing devices, piping, tubing, valves, and fuel oil pumps • General requirements of oil supply tanks based on location (indoors, outdoors aboveground, underground) • Capacity and protection of oil supply tanks based on location (indoors or outdoors aboveground) • Underground piping • Tank connections • Air for combustion and venting • Venting products of combustion • Test and maintenance requirements • Annexes • Requirements for installation of oil burning stationary engines. • Requirements for installation of portable oil burning equipment • Requirements for special installations such as used oil appliances, construction heaters and vehicle heaters • Requirements for installation of oil burning equipment for residential and small commercial buildings

OIL BURNER TECHNICIAN CURRICULUM

Module Title: Installation Codes, Acts and Regulations. **Prerequisite(s):** None **Estimated hours**: 8

Task: Demonstrate an understanding of the codes and acts that affect the installation of fuel oil

Module 02	**Learning Objectives: Upon successful completion, the student will be able to:**	**Theory**
		Content
04.03.03	Demonstrate an understanding of the general requirements for fuel oil installations.	General requirements • Acceptable equipment • Responsibilities of the installer • Initial activation • Before leaving a new installation • Posting of instructions • Conversion from a different energy source • Replacement of components • Quality of work • Suitability of equipment and chimney • Accessibility • Electrical features • Gas features • Supply of fuel oil • Hazardous atmosphere • Fuel oil filters and strainers • Preheating of fuel oils • Emergency shut-off devices • Appliance clearances to building construction • Clearance to combustibles • Clearance to non-combustibles • Servicing and maintenance clearances • Appliance installation — General requirements • Appliance installation in garages • Appliance installation in aircraft hangars • Outdoor installations • Maintenance

OIL BURNER TECHNICIAN CURRICULUM

Module Title: Installation Codes, Acts and Regulations. **Prerequisite(s):** None **Estimated hours**: 8

Task: Demonstrate an understanding of the codes and acts that affect the installation of fuel oil.

Module 04	**Learning Objectives: Upon successful completion, the student will be able to:**	**Theory**
		Content
04.04.01	Refer to sections of other acts, regulations and codes and that have an act on fuel oil installations	Occupation Health and Safety Act • WHMIS, workers' rights, asbestos Pressure Vessels Act • Boilers, welded piping, containers, cylinders Ontario Building Code • Residential ventilation requirements • Chimney construction requirements • Clearances from factory-built chimneys/vents Transportation of Dangerous Goods • Restrictions/ requirements for transporting fuel oil and combustible gases Ontario Electrical Code • Accessibility clearances, vent termination clearances, separate circuits, wire sizing, switch requirements, permits and inspections Trades Qualification and Apprenticeship Act and Regulations • Job descriptions and qualifications Environmental Protection Act • Spills reporting, response, and clean-up requirements Installation Requirements for Fuel Oil Appliances in Mobile Homes • Specific requirements for installation of appliances in mobile homes CSA B138.1 and B138.2 Portable oil-burning equipment — Packaged equipment requirements/ Installation requirements • Specific requirements for construction and installation of portable appliances

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated theory hours:** 12

Task: Identify piping, tubing, fittings and joining methods

Module 05	**Learning Objectives: Upon successful completion, the student will be able to:**	**Theory**
		Content
05.01.01	Identify all types of oil piping, tubing, fittings, and joining methods	Identify copper and stainless-steel tubing • material types and standards (stricter standards given in the B139.1.0 Code) • types of installations where tubing is commonly used • outer plastic coating required for copper tubing • available and commonly used types and sizes of tubing and fittings • methods of joining: forged flare fittings, brazing, or approved press-connected fittings • compression fittings shall not be used • requirement to have access to concealed press-connected tubing joints • requirement to clearly identify press-connected tubing joints • prohibited fittings Identify steel piping • material types and standards (stricter standards given in the B139.1.0 code) • types of installations where piping is commonly used • available and commonly used sizes and lengths • methods of joining: threaded or welded • threaded engagement and fitting allowances • welding to be performed by a qualified welder using procedures approved by TSSA • recommendation to weld / braze concealed piping or install access points for threaded or flanged pipe joints • prohibited fittings • limited allowance to use galvanized pipe Identify underground piping • material types and standards given in the B139.1.0 Code • types of installations where underground piping is commonly used • must be double-walled with joints only in monitored sumps • must be installed by a qualified OBT or PM2 who has been trained in the certified manufacturer's installation procedures.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated theory hours:** 12

Task: Identify flex connectors/hoses and code requirements for piping and tubing

Module 05	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
05.01.02	Identify all types of oil flexible connectors, hoses, and fittings	Identify flexible connector and hose • flexible stainless-steel tubing and/or reinforced neoprene with braided stainless-steel exterior which may have a protective coating • available and commonly used sizes and lengths • must be approved for fuel oil use and for the intended pressure and temperature • fitting ends must be installed by the manufacturer • allowed lengths (maximum and sometimes minimum) depends on type of installation • must be installed in accordance with the manufacturer's written instructions, specifically including restrictions and limitations on bending of the connector.
05.02.01	Identify and interpret the code requirements for piping / tubing installations as applicable to residential and small commercial buildings	B139.2 Code requirements for piping/tubing installations: • all external parts of fuel containing devices shall have a melting point over 538˚ C (1000 ˚F) except as allowed by the code • brazed and welded connections shall be made by qualified personnel as per ASME Boiler and Pressure Vessel Code, Section or as otherwise required by TSSA. • minimum allowed size of piping and tubing • line connection to bottom of tank only permitted for tanks with a capacity ≤ 2500L • line in solid flooring laid in channel with removable cover or in duct as per code • line passing through exterior wall or wall constructed of masonry or concrete shall be sleeved or double wrapped with pipe wrap tape • line shall be protected from corrosion or physical damage • oil piping shall be properly supported using materials and maximum spacing specified in the B139 code and not be supported by any other piping • underground oil lines must be double-walled and installed by a properly certified technician who has been trained by the manufacturer of the piping being used • requirements for rooftop piping and underground piping in the B139.1.0 Code

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated theory hours:** 12

Task: Identify valves used in oil installations

Module 05	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
05.03.01	Identify and select valves as applicable to oil installations	Valves • gate, ball, in-line manual shut-off valves • anti-siphon / oil safety valves • approved fire safety / fusible-link valves • relief valves • electrically operated valves • code requirements in the B139.1.0 Code for large oil installations are stricter than in the B139.2 code for residential and small commercial buildings Fittings used with valves • fitting types and joining methods specified in B139 code • furled compression fittings not allowed • use of joint compound/pipe dope

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated theory hours:** 12

Task: Identify piping installation equipment and methods

Module 05	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

05.04.01	Identify types and proper use of manual and powered pipe cutters, reamers, pipe dies and threaders	• Types of pipe threaders
		  ○ manual threaders
		  ○ power threaders
		• Types of dies
		  ○ preset
		  ○ hand dies
		  ○ speed dies
		• Types of cutters
		  ○ manual
		  ○ powered
		  ○ chain wheel cutters
		  ○ single and multiple wheel cutters
		• Types of reamers
		  ○ manual
		  ○ powered
		• Threading procedure
		  ○ cutting
		  ○ reaming
		  ○ threading
		  ○ thread length and taper
		  ○ cutting oil
		  ○ cleaning
		  ○ assessing thread condition
		• Equipment maintenance
		  ○ cleaning
		  ○ replacing dies and cutting wheels

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated theory hours:** 12

Task: Identify tubing installation equipment and methods

Module 05	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

05.04.02	Identify types and proper use of tube cutting, reaming, bending and flaring equipment	• Types of cutters
		  ○ manual
		  ○ powered
		  ○ single and multiple wheel cutters
		• Types of benders
		  ○ manual
		  ○ powered
		• Types of flaring tools
		  ○ ratchet
		  ○ block and yoke
		  ○ hammer type
		  ○ drill type
		• Procedure to bend tubing
		  ○ select bender for application
		  ○ type of copper to bend
		  ○ marking of tubing for 45-degree bend
		  ○ marking of tubing for 90-degree bend
		• Procedure to flare tubing
		  ○ select type of copper or stainless-steel tubing for application
		  ○ size of tubing that can be flared
		  ○ reaming and cleaning before flaring
		  ○ install proper size and type of flare nut before reaming
		  ○ 45-degree flare end that fits flare nut properly
		  ○ assessing flare condition
		• Equipment maintenance
		  ○ cleaning
		  ○ replacing cutting wheels

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated theory hours:** 12

Task: Hangers and piping supports

Module 05	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
05.05.01	Identify types and uses of pipe/tube hangers/supports.	Hanger types • hangers • strap hangers • clevis • riser clamps • beam clamps • roller hangers • trapeze hangers • U-bolts • wall supports • concrete inserts • expansion plugs • cement anchors • treated wood blocking Hanger/support requirements • piping shall be properly supported using materials and maximum spacing specified in the B139 code and not be supported by any other piping
05.06.01	Describe leak testing procedures for oil lines	Two methods to test a newly installed aboveground piping or tubing system that has been isolated from the tank • pneumatic test (test pressure and duration different for large and small installations) • vacuum test (only permitted at residential and small commercial installations) Underground piping shall be tested as per manufacturer's instructions and the B139 Code

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated theory hours:** 12

Task: Selection and joining of piping and tubing for use in water service.

Module 05	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

05.07.01	Identify all types of water service piping and tubing material.	Types
		• copper
		• steel
		• galvanized
		• stainless steel
		• brass
		• plastic
		  ○ ABS
		  ○ PVC / CPVC
		  ○ PE

05.07.02	Identify the joining methods for water service piping and fittings.	Joining methods
		• soldering
		• threading
		• flaring
		• compression
		• press-connected
		• inset adaptors
		  ○ gear clamp
		  ○ pinch clamp ring
		Fittings
		• materials, types, uses
		• sealant types and uses
		Valves
		• shut off
		• mixing
		• back-check

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated theory hours:** 12

Task: Protect piping/tubing from corrosion

Module 05	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
05.08.01	Describe the reasons for corrosion protection.	Definition and causes of corrosion • electrolytic action • corrosive materials / vapours • concrete / masonry • microbial induced corrosion
05.08.02	Explain method for protecting various piping and tubing materials, joints and fittings from corrosion.	Protection methods • pipe painting • pipe wrap tape • sleeves • cathodic protection • sealants

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated practical hours:** 16

Performance objective: Cutting, reaming, pipe threading, measuring of black iron pipe, cutting, reaming, and flaring of copper tubing.

Module 05	Practical		
	Scenario	**Procedure**	**Criteria**

05.09.01	The student will learn to identify and use pipe cutters, reamers, pipe dies, threaders, tubing benders, flaring tools, and other tools required to install fuel oil tubing and piping.	The instructor will show all tools and demonstrate how to use them properly.
		
		The students will practice their use in a lab setting
		• Types of dies
		  ○ preset
		  ○ speed dies
		  ○ power threaders
		  ○ hand threaders
		• Types of cutters
		  ○ copper
		  ○ steel
		  ○ chain wheel cutters
		  ○ wheel cutters
		• Types of reamers
		  ○ copper
		  ○ steel
		• Types of benders
		  ○ spring
		  ○ mechanical
		• Types of press-connected equipment
		  ○ Fittings approved for use with fuel oil
		  ○ Power tool for press-connecting fittings
			The instructor will observe the student's use of tools and equipment with respect to:
			
			• safe work practices
			• correct use and handling of tools and equipment
			• accuracy of completed project

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated practical hours:** 16

Performance objective: Cutting, reaming, pipe threading, measuring of black iron pipe, cutting, reaming, and flaring of copper tubing.

Module 05	Practical		
	Scenario	**Procedure**	**Criteria**

05.09.01	The student will learn to identify and use pipe cutters, reamers, pipe dies, threaders, tubing benders, flaring tools, and other tools required to install fuel oil tubing and piping.
	
	(Continued)
		• Threading Procedure
		  ○ cutting
		  ○ reaming
		  ○ threading
		  ○ thread length
		  ○ cutting oil
		• Bending Procedure
		  ○ select bender for application
		  ○ type of copper to bend
		  ○ marking of tubing for 45-degree bend
		  ○ marking of tubing for 90-degree bend
		• Flaring Tools and procedure
		  ○ ratchet
		  ○ block and yoke
		  ○ hammer type
		  ○ type and size of tubing that can be flared
		  ○ 45-degree flare ends
			The instructor will observe the student's use of tools and equipment with respect to:
			
			• safe work practices
			• correct use and handling of tools and equipment
			• accuracy of completed project

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated practical hours:** 16

Performance objective: Measure, cut, ream, thread, and join black iron pipe to copper tubing and leak test.

Module 05	Practical		
	Scenario	**Procedure**	**Criteria**
05.10.01	This exercise will give the student practice cutting and joining pipe and tubing. The student will construct a piping/tubing configuration from a diagram with specifications given by the instructor (See Figure 1.) When complete, the project will be leak tested according to code requirements. Tools and Equipment • hand tools • black iron pipe, fittings • pipe vise, cutter, reamer, threader, cutting oil • pipe joining compound • copper tubing • copper tubing cutter, reamer, bender, flaring tool • forged flare nuts • Brass fittings - pipe to tubing adaptors • leak testing equipment	The student will be given a diagram with measurement and pipe/tube size requirements. The student will use fitting allowances, thread lengths and thread engagements to perform calculations to ensure the completed project is square. The student will: • develop a material list • cut, ream and thread black iron pipe • cut, ream and flare copper tubing • bend copper tubing using tubing benders • leak test with air and/or conduct a vacuum test to meet code leak test requirements • after pressure test dismantle the project	All work must be done safely and will be evaluated by observation of physical actions and oral questioning by the instructor. Calculations must be correct and measurements must be accurate. Equipment must be selected and used properly. The proper number of exposed threads must be showing when the product is complete. The finished product must be square and correctly sized and joined. The finished product must be leak-free When dismantled, there must no indication of thread or flare damage.

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Piping and Tubing Systems **Prerequisite(s): Modules 1 & 2** **Estimated practical hours:** 16

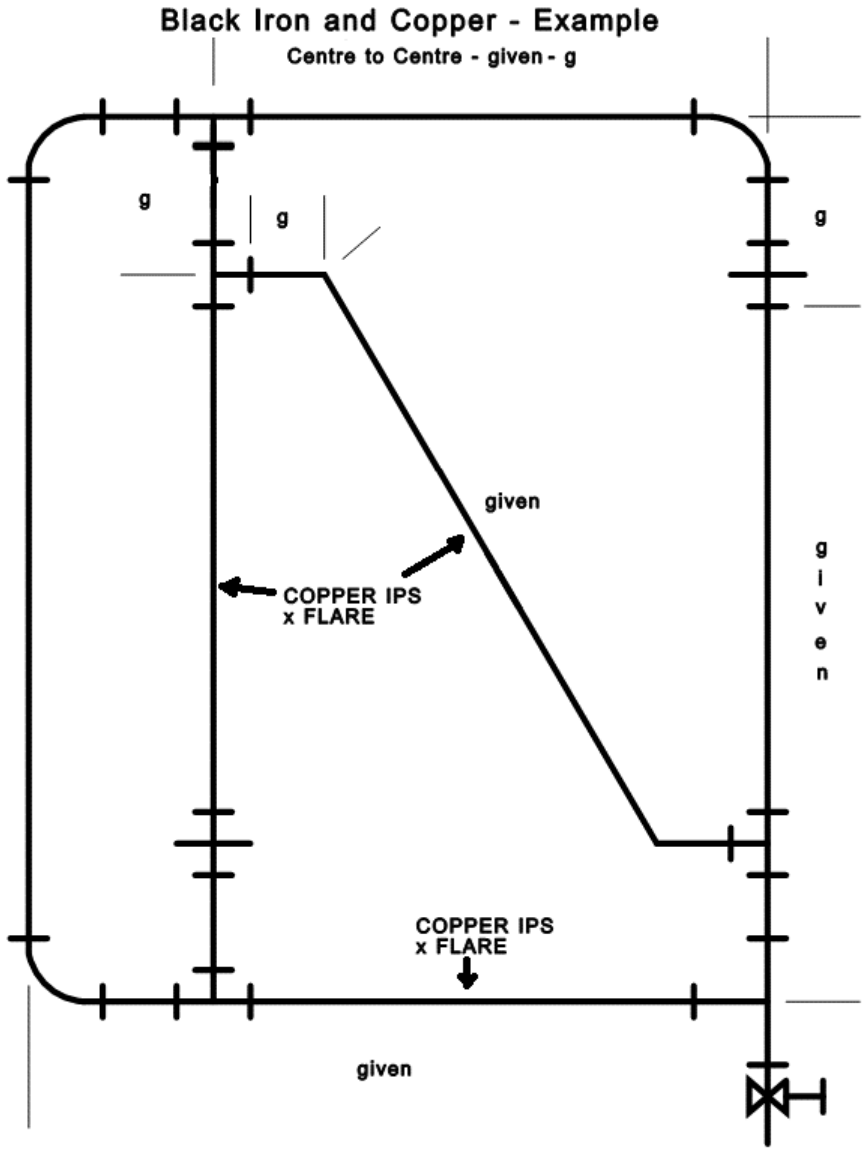

Figure 1

- Instructor to provide “given – g” measurements
- Sections that do not have a given measurement must be calculated
- Material not identified as copper is black iron piping

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5 Estimated theory hours: 12**

Task: Select and test fuel oil storage tank

Module 06	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
06.01.01	Describe types and sizes of fuel oil tanks.	Standards for fuel oil tanks specified in the B139 Code Tank terminology as defined in Fuel Oil Regulation and B139 Code Tank construction • Steel • Welded • Plastic Composites • Fibreglass • Formed • Moulded Tank configurations • round / oval • square /rectangular • horizontal • standard vertical • upright vertical • special configuration for access purposes Types of tanks • underground – double-walled with interstitial monitoring. Must be installed by a PM2 • aboveground (indoors / outdoors) ○ double bottom ○ bottom outlet ○ double walled ○ bottom connected ○ diked ○ pressure filled Sizes of tanks and common uses • 115 L (25 gal) Common size for auxiliary (day) tanks • 230 L (50 gal) Common size for auxiliary (day) tanks • 450 L (100 gal) Common size for auxiliary (day) tanks • 560 L (125 gal) Common size for upright vertical tanks • 720 L (160 gal) Common size for plastic composite tanks • 825 L (180 gal) Common size for upright vertical tanks • 900 L (200 gal) Common size for steel or FRP residential tanks • 1000 L (220 gal) Common size for plastic composite tanks • 1140 L (250 gal) Common size for steel or FRP residential tanks • 2275 L (500 gal) Common size for utility tanks • 2500 L (550 gal) • 4550 L (1000 gal) Common size for utility tanks

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5** **Estimated theory hours: 12**

Task: Select, position and anchor/support storage tank

Module 06	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

06.02.01	Select fuel oil tank and location	Criteria for selection of tanks
		• size of building/consumption
		• access for tank including ceiling height/location in building
		• tank certification
		• Safety installation code (CSA B139)
		  ○ distance of indoor tank from appliance or outdoor tank from building and property line
		  ○ maximum capacity of indoor unprotected storage (individual and aggregate)
		  ○ protection of outdoor tanks from vehicular damage
		  ○ fire code and building code (national and provincial)

06.03.01	Describe current codes and fire regulations related to positioning and anchoring of oil storage tanks.	• support foundations and anchorage for tank location • distance from appliance, walls, other tanks, points of egress, electrical panel • distance of indoor tank from appliance or outdoor tank from building and property line • maximum capacity of indoor unprotected storage (individual and aggregate) • protection of outdoor tanks from vehicular damage • requirements for spill containment devices • requirements for sloping a metallic tank equipped for end or bottom outlet or a top supply line • requirement to comply with tank manufacturer's installation instructions unless code requirement is stricter

06.03.02	Position storage tank	• Back safety and lifting
		• Personal protection equipment
		  ○ gloves
		  ○ safety boots
		  ○ kidney belts/back
		• Respect for property
		  ○ size of access
		  ○ manoeuvrability of the tank
		  ○ obstructions

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5** **Estimated theory hours: 12**

Task: Install fill and vent pipes with swing joints

Module 06	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
06.04.01	Determine installation requirements for fill and vent lines.	B139 Code requirements for fill and vent pipes • terminate outdoors unless otherwise allowed (i.e. tanks <45L integral to appliances) • allowable materials • minimum size of fill and vent pipes • maximum height of fill and vent pipes above bottom of tank • minimum height of fill and vent pipes above grade and each other • minimum distance from windows, doors, and openings • slope and direction of slope • termination cap requirements • requirements for fill and vent pipes from multiple end- or bottom-connected tanks • requirements for fill and vent pipes from pressure-filled multiple top-connected tanks • vent pipes shall not be cross-connected with fill pipes or oil return lines from burners • requirements for fill and vent/overflow pipes from auxiliary tanks • overfill protection requirements • emergency vent requirements • code requirements in the B139.1.1 Code for large oil installations are stricter than in the B139.2 Code for small residential and commercial buildings

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5 Estimated theory hours: 12**

Task: Install visual, signal or distant reading gauge

Module 06	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

06.05.01	Describe characteristics, operation and installation requirements for visual, signal and distant reading gauges.	• Visual observation of oil level
		  ○ visual observation through the fill opening or use of a measuring stick is only permitted for outdoor tanks (not recommended)
		• Visual gauge
		  ○ certified to standards listed in B139 code
		  ○ float on a swing arm or float on string
		  ○ indicates fuel level but not reliable for filling
		  ○ installation instructions
		  ○ arrow points to long end of tank
		• Audible gauge/signal
		  ○ certified to standards listed in B139 code
		  ○ vent air goes through whistle as tank is filled and stops when oil at whistle inlet
		  ○ allows for expansion of oil 4"/6" below top of tank
		  ○ installation instructions
		• Remote gauge/signal
		  ○ certified to standards listed in B139 code
		  ○ mostly used for underground tanks or large tank installations
		  ○ must provide audible and visual indication when tank meets safe fill level
		  ○ may provide level indication
		  ○ operates electronically or pneumatically
		  ○ installation instructions

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5 Estimated theory hours: 12**

Task: Install one or two-pipe system oil supply lines

Module 06	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
06.06.01	Describe oil line sizing and codes	Oil line sizing for single-line and two-line systems • type of piping / tubing employed • capacity of equipment • number of units being supplied • vertical lift restrictions • horizontal distance and component flow restriction • two-line system shall not be used for outdoor tanks Pump manufacturer specification for pipe size based on their criteria
06.06.02	Describe types, features and operation of valves and associated fittings	Valves • gate, ball, in-line manual shut-off valves • anti-siphon / oil safety valves • approved fire safety / fusible-link valves • relief valve • electrically operated valve • code requirements in the B139.1.1 Code for large oil installations are stricter than in the B139.2 code for residential and small commercial buildings Fittings • fittings and joining methods specified in B139 code (furled compression not allowed) • use of joint compound/pipe dope • use of approved joint tape

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5 Estimated theory hours: 12**

Task: Install one or two-pipe system oil supply lines

Module 06	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
06.07.01	Describe types, features, operation and servicing of oil filters / strainers	Type and construction of oil filters / strainers • certified for the intended use • casing material has a melting point over 538˚C (1000˚F) or equipped with an approved fusible-link valve located immediately upstream • micron rating as per B139 code for nozzle sizes of less than 2.8 L/h (0.75 USGPH) • micron rating as per appliance / burner manufacturers' instructions for larger nozzles • filter elements: brass or stainless-steel mesh (cleanable); felt or paper cartridge (non-cleanable) • corrosion resistant Location of filters / strainers • located indoors wherever feasible • located above a spill containment device as specified in the B139 Code • located upstream of an oil de-aerator • located downstream of an oil preheater • appliance / burner manufacturers' instructions may require a primary filter at the tank outlet and a finer filter at the burner inlet • accessible for servicing • securely supported • should have a valve immediately upstream for servicing Sizing filters / strainers • Size as per appliance / burner manufacturers' instructions • Based on suction line size, flow rate through the filter, and type of fuel. Servicing filters / strainers • frequency - annually • prime cannister after servicing • gaskets and their purpose • use of sealing compound/pipe dope • minimize fuel spillage using spill containment device • response to minor spills during servicing

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5** **Estimated theory hours: 12**

Task: Install one or two-pipe system oil supply lines

Module 06	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
06.08.01	Describe the features and operation of a one-line and two-line systems and modified one- and two-line systems with de-aerator	One-line system • one suction / supply line to the inlet of the pump or constant level valve • normally gravity feed • not self-priming • fuel flow same as nozzle rating • by-pass plug in pump must be removed • purpose and application of one-line system Two-line system • one suction / feed line to the pump inlet and one return line to the tank • may be gravity feed but normally when the burner fuel, oil pump is above the tank • self-priming • fuel flow rate through supply line is the same as the pump flow rate capacity • by-pass plug in pump must be installed • cannot be used for outdoor tank installations • shut-off valve not allowed in return line unless a pressure relief valve is installed • purpose and application of two-line system Modified one- and two-line system with de-aerator • one suction / feed line to the de-aerator and one supply line to the burner with a return line to the inlet of the de-aerator • may or may not be gravity feed • by-pass plug in pump must be installed • fuel flow rate through supply line to the de-aerator is the same as the nozzle rating • fuel flow rate through supply line from the de-aerator to the pump is the same as the pump flow rate capacity • can be used for outdoor tank installations • must have a fusible-link valve located immediately upstream of the de-aerator • purpose and application of modified one- and two-line system with de-aerator

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5 Estimated theory hours: 12**

Task: Install of one- or two-pipe system oil supply lines

Module 06	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
06.09.01	Describe installation procedures for one- and two-line systems.	Installation procedures for both one- and two-line systems • valve at the tank outlet and wherever required for serving • filter located indoors wherever feasible and preferable at tank and at burner • materials used for piping/tubing, fittings, and any fuel containing devices meet code requirements • line connection to bottom of tank only permitted for tanks with a capacity ≤ 2500L • line in solid flooring laid in channel with removable cover or in duct as per code • line passing through exterior wall or wall constructed of masonry or concrete shall be sleeved or double wrapped with pipe wrap tape • line shall be protected from corrosion or physical damage • oil piping shall be properly supported using materials and maximum spacing specified in the B139 code and not be supported by any other piping • inlet to a supply line taken from the top of the tank that is sloped must be close to the bottom of the tank where the water/debris accumulates • underground oil lines must be double-walled and installed by a properly certified technician who has been trained by the manufacturer of the piping being used Installation procedure specific to two-line systems • return line must be same size as supply line • return line entering the top of the tank shall be connected to a drop tube that extends to a maximum of 15 cm (6 in) from the bottom of the tank and be provided with a minimum 6 mm (1/4 in) diameter hole located at the top of the drop tube to prevent siphoning if the return line breaks • inlet to supply line and outlet of return line in tank should be separated to encourage mixing • using single or duplex bushing in tank • using T fitting or de-aerator

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5 Estimated theory hours: 12**

Task: Describe purpose, components and installation of auxiliary/booster pumps and loop systems

Module 06	**Learning Objectives: Upon successful completion, the student will be able to:**	**Theory**
		Content
06.10.01	Describe purpose of auxiliary pumps and booster pumps	Auxiliary pump required when • the manufacturer specifications for the appliance for height/distance exceeded • an auxiliary tank is used Booster pump required when • burner fuel oil pump is more than 4.9 m (16 ft) above the bottom of the supply tank • used in loop line system to supply constant supply of fuel oil to multiple appliances
06.10.02	Describe components of loop line system	Components of loop line system • booster pump • filters • fittings • vacuum • oil safety valve • check valve • lines and line sizing
06.10.03	Describe installation procedures for auxiliary pumps and loop line systems.	Auxiliary pumps • always two line • uses by-pass travelling through the appliance • located at bottom of primary lift • pipe into inlet and out routed using isolating valves and check valves Loop line systems • relief valve on pump outlet returns excess pressure to inlet of booster pump • continuous oil supply loop from tank to the booster back to tank • appliances are tied into the supply loop • booster pump constantly runs • isolating valve and oil safety valve at each appliance • check valve in the suction line from the tank

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5 Estimated theory hours: 12**

Task: Leak testing procedures for tanks and oil lines

Module 06	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
06.11.01	Describe leak testing procedures for tanks	Two methods to test a newly installed single-wall fuel oil tank and its connections • pneumatic test (test pressure and duration the same large and small installations) • hydrostatic test (same procedure for large and small installations) • requirements for when the test is conducted and who is responsible for the test Tanks with secondary containment shall be tested as per manufacturer's instructions
06.11.02	Describe leak testing procedures for oil lines	Two methods to test a newly installed aboveground piping or tubing system that has been isolated from the tank • pneumatic test (test pressure and duration different for large and small installations) • vacuum test (only permitted at residential and small commercial installations) Underground piping shall be tested as per manufacturer's instructions and the B139 Code

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5 Estimated practical hours: 8**

Performance Objective: Assess one or more installations of fuel oil supply tank and delivery systems for proper installation

Module 06	Practical		
	Scenario	**Procedure**	**Criteria**
6.12.01	In this scenario the student will assess one or more installations of fuel oil supply tank and delivery systems for proper installation	Instructor will identify one or more installations to be assessed in the lab or at an alternate site (detailed video(s) of an installation may also be employed). For each installation, the instructor shall first conduct his or her own assessment of code compliance and corrective measures or improvements that could be made at the installation.	Student must correctly identify any code deficiencies and how to correct these infractions as well as identify improvements that could be made at each installation.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5 Estimated practical hours: 8**

Performance Objective: Install one or two pipe system oil supply lines.

Module 06	Practical		
	Scenario	**Procedure**	**Criteria**
06.13.01	This instructor-led demonstration is designed to show the student the differences between one- and two-line systems and show the need for two-line systems in some applications. Materials: • Burner assembly • Fuel unit and piping materials • Hand tools • Oil supply	In this demonstration, the instructor will assemble and describe the purpose(s) of all components required for one- and two-line systems. A gravity-fed one line system will be assembled, bled and put into operation. Ideally, the fuel unit should then be elevated to a point where it will no longer function properly. (Failing this, a restriction should be imposed in the oil line feeding the fuel unit, to simulate a lift). The instructor will explain why the system does not work as desired. The instructor should then explain how to and then convert the assembly to a two-line system, bleed it and put into operation.	The student will demonstrate the ability to install one- and two-line systems, or explain in detail the materials required, the processes involved and reasons for installing one or the other. The instructor can perform either a practical or an oral evaluation using checklist formats as described in other modules.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Fuel oil supply tank and delivery systems **Prerequisite(s): Modules 1, 2 and 5 Estimated practical hours: 8**

Performance Objective: Leak test an oil tank and oil lines

Module 06	Practical		
	Scenario	**Procedure**	**Scenario**
06.14.01	This instructor-led demonstration is designed to show the student the procedures for leak testing an oil supply tank with a capacity of 2500L or less. Materials: • Oil supply tank • Tools, air pump, and gauge to perform a pneumatic test • Tank manufacturer's installation instructions	The instructor will demonstrate and describe the purpose, various procedures, and potential safety concerns for testing oil supply tanks. • Pneumatic test • Hydrostatic test • Manufacturer's test procedures for double wall tanks	The student will demonstrate the ability to leak test an oil supply tank, or explain in detail the materials required, the processes involved and reasons for leaking testing tanks. The instructor can perform either a practical or an oral evaluation using checklist formats as described in other modules.
06.14.02	This instructor -led demonstration is designed to show the student the procedures for leak testing oil supply lines. Materials: • Oil supply tank, supply line, and burner assembly • Tools, air pump, and gauge to perform a pneumatic test • Vacuum gauge Burner/pump manufacturer's installation instructions	The instructor will demonstrate and describe the purpose, various procedures, and potential safety concerns for testing oil supply tanks. • Pneumatic test • Vacuum test • Manufacturer's test procedures for double wall tanks	The student will demonstrate the ability to leak test an oil supply tank, or explain in detail the materials required, the processes involved and reasons for leaking testing tanks. The instructor can perform either a practical or an oral evaluation using checklist formats as described in other modules.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Fuel Oil Fired Appliances **Prerequisite(s): Module 3 to 6** **Estimated theory hours: 8**

Task: Identify, interpret, and apply appliance terminology

Module 07	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
07.01.01	Identify, interpret, and apply terms employed in the categorization and description of appliance types	Appliance categorization terms • approved / not approved • certified / not certified • heat transfer methods: convection, conduction, radiation • direct-fired / indirect-fired • medium being heated – water, air • how the heated medium is delivered: mechanical / natural • appliance efficiency – high, medium, low • venting method – unvented, natural draft, power vented, direct vent • how flue gases pass through then appliance: revertible flue, 2-/3-/4- pass firetube boilers • how the heated medium passes through the appliance: up-flow, downflow, horizontal, gravity, watertube • add-on features: heating/cooling units, combo water/space heaters • fuel being used: kerosene, fuel oil grades, diesel, used oil, wood and oil • firing rate: ≤ 2.5 gph (defines which part of the B139 Code applies, ≤ 7 gph defines certification requirments • where the appliance is usually installed: residential, commercial, agricultural, industrial • where the appliance is usually positioned: roof-top, wall mount, suspended, portable • purpose of the appliance: potable / non-potable water heater, central heating, space heating, construction heat, decorative, generator How a combination of the above terms is used to convey important information in manufacturer's literature / rating plates and discussions with co-workers and customers.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Fuel Oil Fired Appliances **Prerequisite(s): Module 3 to 6** **Estimated theory hours: 8**

Task: Identify types, components, regulatory requirements, and safety issues related to water heaters

Module 07	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
07.02.01	Identify the types, components, and basic operation of hot water heaters	Types • under-fired storage • coil-tube • potable / non-potable • combo water heating/space heating (basic information only; details in OBT-2 course) Components • burner type and position (see Module 8 for detailed information on burners) • operating and limit controls (purpose only – see Module 12 for types) • dip tube • anodes • heat exchanger and flue baffle • temperature and pressure relief valve • mixing valve
07.02.02	Identify safety and regulatory issues related to hot water heaters	Safety issues: • scalding • bacteria growth • sediment buildup • expansion of heated water • change of state from water to steam • leaking tanks and relief valves • clearance to combustibles Regulatory issues • requirements to comply with the Plumbing Code • OBT certificate limitations for working on water piping that is essential to the operation of the appliance • requirement to comply with rating plate approval for purpose and fuel type

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Fuel Oil Fired Appliances **Prerequisite(s): Module 3 to 6** **Estimated theory hours: 8**

Task: Identify types, components, regulatory requirements, and safety issues related to air heating appliances

Module 07	**Learning Objectives: Upon successful completion, the student will be able to:**	**Theory**
		Content

07.03.01	Identify the types, components, and basic operation of air heating	Types
		• Forced air distribution
		• Gravity air distribution
		• Space heater
		  ○ free-standing / decorative
		  ○ wall heater
		  ○ construction heater
		  ○ radiant tube
		  ○ unit heater
		  ○ vehicle heater
		Components
		• burner type and position (see Module 8 for detailed information on burners)
		• operating and limit controls (purpose only – see Module 12 for types)
		• position of air circulating blower: low-boy, high-boy, horizontal, downflow, duct furnaces
		• heat exchanger configurations: primary, secondary, condensing, revertible flue, and wood/oil
		• air filters (basic purpose only)

07.03.02	Identify safety and regulatory issues related to air heating appliances	Safety issues: • clearance to combustibles • damaged/cracked heat exchangers Regulatory issues • requirements to comply with the Building Code regarding ductwork • OBT certificate limitations for working on ductwork that is essential to the operation of the appliance • requirement to comply with rating plate approval for purpose and fuel type

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Fuel Oil Fired Appliances **Prerequisite(s): Module 3 to 6** **Estimated theory hours: 8**

Task: Identify types, components, regulatory requirements, and safety issues related to boilers

Module 07	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
07.04.01	Identify the types, components, and basic operation of boilers	Types • cast iron • steel tube • hot water only or steam (low or high pressure) • firetube / watertube Components • burner type and position (see Module 8 for detailed information on burners) • operating and limit controls (purpose only – see Module 12 for types) • position of air circulating blower: low-boy, high-boy, horizontal, downflow, duct furnaces • circulating pump (basic purpose only) • expansion tank (basic purpose only)
07.04.02	Identify safety and regulatory issues related to boilers	Safety issues: • clearance to combustibles • expansion of heated water • change of state from water to steam • leaking heat exchanger and relief valves Regulatory issues • requirements to comply with the Plumbing Code and Boiler/ Pressure Vessels Code • OBT certificate limitations for working on water piping that is essential to the operation of the appliance • requirement to comply with rating plate approval for purpose and fuel type

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Fuel Oil Fired Appliances **Prerequisite(s): Module 3 to 6** **Estimated theory hours: 8**

Task: Identify types, components, regulatory requirements, and safety issues related to stationary engines

Module 07	**Learning Objectives: Upon successful completion, the student will be able to:**	**Theory**
		Content

07.05.01	Identify the types, components, and basic operation of engines	Types
		• Stationary / portable
		• Designed to power generators, pumps, compressors
		Components
		• Identify components covered and excluded from OBT scope of certificate
		  ○ OBT scope of certificate does not include work on engine components, adjustment of engine combustion, or work on motor vehicle engines
		  ○ OBT scope of certificate does include work on supply tanks and lines to stationary engines and the exhaust/vent system from stationary engines

07.05.02	Identify safety and regulatory issues related engines	Safety issues: • clearance to combustibles – especially regarding the exhaust pipe • vibration (requires use of flexible connectors) Regulatory issues • requirements to comply with the B139.1.1 General requirements for stationary engines • requirements to comply with the B138.1 and B138.2 Portable oil-burning equipment — Packaged equipment requirements/ Installation requirements • requirements to comply with the Building Code, Fire Code, Electrical Code • OBT certificate limitations for working on electrical wiring that is essential to the operation of the appliance

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Fuel Oil Fired Appliances **Prerequisite(s): Module 3 to 6** **Estimated practical hours: 2**

Performance objective: Identify types, components, regulatory requirements, and safety issues related to various oil-fired appliances.

Module 07	Practical		
	Scenario	**Procedure**	**Criteria**
07.06.01	Instructor will guide students through the shop and/or employ photos/videos of oil appliances and ask them to identify the type, components, regulatory requirements, and safety issues related to each appliance. This exercise may be integrated into the performance tasks required by other Modules after learning about burners, controls, and/or venting systems.	Instructor will ask questions designed to prove the student's ability to identify appliance types, components, regulatory requirements, and safety issues related to a variety of appliances in the show or on visual teaching aids, Students will complete work sheets (example attached) for at least two different types of appliances.	Student must read and apply information from the rating plate and, if applicable, the manufacturer's instructions to correctly answer questions asked verbally by the instructor and/or in writing on work sheets. Students must use proper terms and show a practical understanding of the theory presented in this Module.

Module Title: Introduction to Fuel Oil Fired Appliances **Prerequisite(s): Module 3 to 6** **Estimated practical hours: 2**

MODULE 07
SAMPLE STUDENT WORK SHEET

APPLIANCE NUMBER _____

1. Type of appliance ..... Direct fired ❑ **or** Indirect-fired ❑
2. Fuel type(s) approved for use with the appliance .....
3. Approved appliance firing rate(s) .....
4. Heat transfer method.....
5. Venting method: Unvented ❑ Natural draft ❑ Power vented ❑ Direct vent ❑
6. Type of burner(s): ❑ Vaporizing pot burner ❑ Atomizing burner
7. Type of operating control: .....
8. List all safety controls .....

   .....
9. List clearance to combustible requirements .....

   .....
10. Identify two safety concerns regarding this appliance type: .....

    .....
11. Identify which Part(s) of the B139 Code apply to this appliance: B139.1.0 ❑ B139.1.1 ❑ B139.1.2 ❑ B139.2 ❑

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated theory hours: 12**

Task: Identify types of burners and burner components

Module 08	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
08.01.01	Identify basic types and applications of oil burners	• Vaporizing type (Pot burners) ○ usually approved for kerosene or No.1 fuel oil but may be approved for No. 2 ○ input normally limited to less than 2 USGPH ○ primarily used for space heating ○ much less common than atomizing burners but still available for sale • Atomizing types ○ two major types – mechanical atomization and pressure atomization ○ mechanical atomization - rarely (if ever) encountered and no longer available for sale ○ two sub-types of pressure atomizing burners ▪ low pressure – under 100 psi and usually 1 to 10 psi. - not commonly encountered ▪ high pressure 100 psi or greater ○ usually approved to fire on No.1 and No.2 fuel oil but may be approved for B5 biofuel ○ input ranges from 0.4 USGPH to well over 7 USGPH ○ employed on most residential, commercial, and industrial oil appliances
08.02.01	Describe the characteristics and operating features of vaporizing oil burners	○ use fuel approved on the rating plate - usually kerosene or No.1 fuel ○ oil fed into pot through a metering device (constant level valve) calibrated in c.c./s ○ vaporization occurs and is maintained on the surface of the oil in the pot if oil temperature is above the fire point ○ combustion air and excess air is normally introduced passively by convection as heat rises but may be fan assisted in some limited cases ○ electrically or manually ignited with no automatic flame monitoring
08.02.02	Describe basic characteristics and operating features of mechanical atomizing oil burners	○ a brief description of wall-flame burners and rotary cup burners will provide historical perspective to the focus on pressure atomizing burners. No longer employed or available. ○ wall-flame burners deliver oil through a constant level valve to spinning fan blades located in the bottom center of a combustion chamber. Oil is atomized as it is flung against the combustion chamber wall with most of the oil burning in suspension. Oil is ignited by a continuous spark or vaporizing pot type constant pilot. ○ horizontal rotary cup burners employ a fast-spinning cone shaped cup and high velocity fan. Oil is delivered to the cup by gravity through a metering valve and a fine film of oil flows off the edge of the cup and is atomized into droplets by the high velocity air.

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated theory hours: 12**

Task: Identify types of burners and burner components

Module 08	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
08.02.03	Describe the characteristics and operating features of low-pressure atomizing oil burners	○ use fuel approved on the rating plate - usually No. 1 or No. 2 fuel oil but may be approved in some provinces for burning used oil ○ motor drives combustion air fan which supplies secondary air to the combustion head to atomize the oil/air mixture leaving the nozzle ○ a separate fuel unit supplies oil through a pressure regulating valve – usually at 1 to 10 psi to the nozzle where oil is mixed with air ○ a separate compressed air supply provides primary air through a pressure regulating valve to the mixing nozzle assembly ○ an oil preheater is sometimes employed on used oil burners to ensure proper viscosity – usually set at 140˚F ○ electrodes from a step-up transformer ignite the fuel vapours from the atomized droplets ○ oil is burned in suspension ○ flame safety is monitored and controlled by a light sensor
08.02.04	Describe the characteristics and operating features of high-pressure atomizing oil burners	○ use fuel approved on the rating plate - usually No. 1 or No. 2 fuel oil ○ motor drives combustion fan and fuel unit (integral fuel pump) ○ oil is forced at high pressure through the nozzle which creates a thin film of oil spray into the combustion chamber ○ air from the combustion fan is directed through the combustion head at the oil spray to break the oil into droplets ○ electrodes from a step-up transformer ignite the fuel vapours from the atomized droplets ○ oil is burned in suspension ○ flame safety is monitored and controlled by a temperature or light sensor

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated theory hours: 12**

Task: Identify and describe function of vaporizing pot burner components

Module 08	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
08.03.01	Identify and describe function of components in vaporizing pot burners	Components: ▪ constant level valve (often called a carburetor) ○ fed by gravity with restrictions on oil head pressure applied to inlet ○ cleanable, mesh filter ○ safety trip float shuts off oil flow if level of oil in pot exceeds safe level ○ float controlled needle valve maintains constant level of oil in the device ○ manual and thermostat control button with bimetal strip allows for complete shut-off of oil or firing rate control ▪ metal vaporizing pot inside a metal combustion chamber ▪ rings of air holes in pot introduce combustion air at various levels to support combustion at varying firing rates ○ Low fire flame ring contains the pilot flame during the off-cycle to keep the pot warm ○ High fire ring, on a call for heat, the flame fills the pot up to the high fire ring ▪ if air is supplied passively, the input is usually less than 1 USGPH ▪ if air is supplied by a fan, the input may be as high as 2 USGPH • natural draft vent length and restrictions must be minimized and excessive draft controlled through a barometric damper (often built into the appliance) • manual or electronic ignition of a low-fire or pilot flame allows for semi-automatic operation • no automatic flame monitoring

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated theory hours: 12**

Task: Describe general function of components in pressure atomizing burners

Module 08	**Learning Objectives: Upon successful completion, the student will be able to:**	**Theory**
		Content
08.04.01	Identify and describe general function of components in pressure atomizing burners	Fuel handling components • motor and pump coupling • fuel oil pump (fuel unit) • delivery tube and nozzle adapter • nozzle • solenoid oil valve (optional) • oil preheater Combustion air handling components • motor and squirrel-cage fan assembly • compressed air for low oil pressure / high air pressure burners • air gate • air scroll • static disc • blast tube • combustion head Ignition components ▪ ignition transformer ▪ ignition leads ▪ ignition electrodes • burner primary control ○ Cad cell relay ○ Bimetal temperature control or stack relay

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated theory hours: 12**

Task: Describe specific features of fuel handling components in pressure atomizing burners

Module 08	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
08.04.02	Describe the types, features, and function(s) of fuel handling components on pressure atomizing oil burners	Fuel oil pump (fuel unit); ▪ burner motor drives pump by means of a pump coupling designed to break if pump seizes ▪ draws oil from supply tank to burner and, if by-pass plug is installed, returns oil to tank ▪ filters the oil - screen and/or rotary filter ▪ develops and regulates suitable burner nozzle pressure and provides clean cut-in and cut-out flow to the nozzle at 80% of delivery pressure ▪ usual pressure at pump outlet is 100 psi but commonly higher on newer appliances ▪ ports available for supply line, return line, inlet vacuum gauge, outlet pressure gauge, and bleeding air from the supply line and pump ▪ may have one or two gear sets ○ Single stage pump lifts up to 8 feet ○ Two stage pump lifts up to 15 feet Solenoid oil valve types ▪ Delayed action oil valve ○ Delays delivery of oil to the nozzle to ensure maximum oil pressure and air flow to nozzle before opening thus improving initial combustion ○ Fixed time delay ○ closes when de-energized simultaneously with burner motor to prevent after drip ○ usually located at pump outlet ▪ Instantaneous oil valve ○ Provides instantaneous shutoff when de-energized to prevent after drip ○ Normally closed; opens when energized simultaneously with burner motor ○ usually located at pump outlet Delivery tube, nozzle adapter, and optional in-line preheater ▪ draw assembly delivers oil to the nozzle for combustion ▪ centering supports on tube position nozzle in center of combustion head • nozzle adapter allows for easy connection of replaceable nozzle • in-line oil preheater may be installed to reduce viscosity of oil just before nozzle

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated theory hours: 12**

Task: Describe specific features of fuel handling components in pressure atomizing burners

Module 08	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
08.04.02	Describe the types, features, and function(s) of fuel handling components on pressure atomizing oil burners continued	Nozzle; ▪ Functions of a nozzle ○ meter the fuel ▪ size of opening and pump pressure determines flow rate - standardized at 100 psi ○ filter the fuel – screen or cinder filter at nozzle inlet ○ Atomize the oil - reduces the pressure and increases the velocity of the oil to break the flow into a thin stream that assists with the atomization of the oil into droplets ○ determines spray pattern ▪ hollow cone ▪ solid cone ▪ semi-solid cone ○ determines spray angle 30˚ ; 45˚ ; 60˚ ; 70˚ ; 80˚ ; 90˚ ○ may be equipped with a check valve that provides clean cut-in and cut-out flow to the nozzle at a set (non-adjustable) delivery pressure to prevent after drip • Criteria for selecting nozzle flow rate, spray angle and pattern: ○ Determined by appliance manufacturer's rating plate/instructions ○ Shape and size of combustion chamber ○ Combustion head design ○ Combustion chamber type • Effect of changes in fuel oil pressure on nozzle performance ○ Increase in pressure increases atomization and firing rate ○ Decrease in pressure increases droplet size, decreases firing rate, and adversely effects combustion (increased smoke/soot) • Effect of changes in oil viscosity due to oil type or temperature changes ○ Higher viscosity increases droplet size and firing rate and adversely effects combustion (increased smoke/soot) • Remedies to nozzle performance problems ○ Preheat oil ○ Adjust pump pressure to appliance manufacturer's recommendation ○ Replace nozzle – do not attempt to clean nozzle

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated theory hours: 12**

Task: Describe specific features of air handling components in pressure atomizing burners.

Module 08	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

08.04.03	Describe the types, features, and function(s) of air handling components on pressure atomizing oil burners	• Burner motor
		  ○ see Module 9 for information on motor construction and operation
		  ○ 1725 or 3400 rpm
		• Air gate
		  ○ provides method for metering combustion air
		  ○ inner and outer bands
		  ○ may be equipped with an automatic shutter that closes when burner motor is de-energized and opens to a selected setting when burner motor is energized
		  ○ may be connected to ducting from outdoors if approved
		• Squirrel cage fan
		  ○ cleanliness and clearance from housing are critical for proper operation
		• Air scroll or burner housing design
		  ○ design determines the air flow pattern and static capability to the combustion head
		  ○ may require installation or removal of a low-fire plate to match airflow to firing rate
		• Static disc (tubulator)
		  ○ starts twirling action of airflow in the blast tube
		• Blast tube
		  ○ delivers combustion air from the burner housing to the combustion head
		  ○ must be sized and positioned so end is ¼” recessed from combustion chamber wall
		  ○ may be equipped with an insulating cone to prevent heat damage
		• Combustion head
		  ○ patterns the air to improve oil / air mixing and atomization
		  ○ two types: conventional head (pre-1970s) and flame retention head (exclusively used since early1970s. Briefly describe why retention heads are better.
		  ○ two types of retention heads – fixed and adjustable
		  ▪ both have primary, secondary, and excess air slots or openings
		  ▪ Both tightly shape the flame and
		  ▪ fixed heads require nozzle to be positioned a set distance from head and selected based on firing rate as per manufacturer’s instructions
		  ▪ adjustable heads allow for adjustment of excess air opening between combustion head and end cone to match firing rate as per manufacturer’s instructions

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated theory hours: 12**

Task: Describe specific features of ignition components in pressure atomizing burners

Module 08	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
08.04.04	Describe the types, features, and function(s) of ignition components on pressure atomizing oil burners	Ignition transformer ▪ see Module 9 for information on transformer construction and operation ▪ minimum allowed secondary voltage output is 10,000 at 20 mA ▪ Two construction types – iron-core and electronic ▪ Two operation types ○ Interrupted – starts on a call for heat and ceases after a short trial for ignition time or when the flame is proven. Employed on most burners. ○ Continuous – starts on a call for heat and stays on through firing cycle. May be encountered on older burners but rarely employed. Ignition leads or bus bars • leads are flexible, heavily insulated wires connecting transformer to electrodes • bus bars are solid metal plates on the electrodes which springs on the transformer terminals contact when the transformer is secured in place Ignition electrodes • Two solid metal rods with porcelain insulators at positioning clamps • Sharpened and angled ends must be positioned with the gap and orientation to the nozzle as per manufacturer's instructions. Burner primary control – see Module 10 for details on types and operation ○ cad cell relay – light sensing device used on all modern burners ○ stack relay - bimetal temperature sensor positioned in vent connector

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated theory hours: 12**

Task: Describe maintenance requirements and procedures of oil burners.

Module 08	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
08.05.01	Describe the maintenance requirements and procedures for vaporizing pot burners	Vaporizing pot burners • Clean soot out of pipes and heat exchanger • Clean burner pot • Clean constant level valve – filter, orifices, and reservoir • Check flow rate at low and high firing rates • Clean pilot tube • Examine igniter • Ensure that appliance is level • Complete all combustion analysis tests required by the B139 Code and adjust burner to achieve manufacturer's recommended readings – see Module 12
08.05.02	Describe the maintenance requirements and procedures pressure atomizing burners	• Inspect fuel unit – pressure, vacuum and cut-off tests • Clean combustion air blower fan and housing • Clean air gate • Change nozzle • Lubricate blower motor if required • Clean and recalibrate ignition system and flame monitoring components • Check safety timing – trial for ignition and flame failure response timing • Complete all combustion analysis tests required by the B139 Code and adjust burner to achieve manufacturer's recommended readings – see Module 12

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated practical hours: 12**

Performance objective: Disassemble and re-assemble oil burners and identify components

Module 08	Practical		
	Scenario	**Procedure**	**Criteria**
08.06.01	In each of these scenarios, the student will be given a complete burner assembly to work with. The assembly will be dismantled, and all component parts will be identified. The unit will be reassembled and be adjusted to specifications. Materials Vaporizing pot burner Pressure atomizing burner Manufacturer instructions for the supplied burners Hand tools	The student will dismantle an oil burner assembly and identify all components. The components will be reassembled and all components must be set to specifications determined by the instructor or manufacturer . Scenario #1 Vaporizing pot type burner Scenario #2 High pressure burner	The instructor can create checklists for these scenarios using format examples from other modules. All work must be performed safely and in a timely fashion. Proper PPE must be selected and properly employed. The proper tools must be used to dismantle and reassemble the equipment. The student must correctly identify all components. The student must reassemble the components correctly and set all components to specifications determined by the instructor or manufacturer.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated practical hours: 12**

Performance objective: Disassemble and re-assemble oil burners and identify components

Module 08	Practical		
	Scenario	**Procedure**	**Criteria**
08.07.01	In this scenario, the student will check and adjust pressures in a fuel unit of a pressure atomizing burner. Material Complete burner assembly connected to an appliance Hand tools, pressure and vacuum gauges	The instructor will demonstrate how to take pressure and vacuum readings. The student will check pressure, vacuum, and cut off readings. The instructor will ask the student to adjust the pressure downward then up to the specified setting. The student will then fire the burner and adjust the pressure setting to observe the results. The pressure setting must be as per manufacturer's instructions when the procedure has been completed.	The instructor can create checklists for this scenario using format examples from other modules. All work must be performed safely and in a timely fashion. Proper PPE must be selected and properly employed. Correct procedure must be followed to check vacuum and pressures. Correct tools must be used during all stages of the procedure. Student should record pressure and vacuum readings and flame observations

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Burner Types and Oil Burner Nozzles **Prerequisite(s): Modules 1 to 7** **Estimated practical hours: 12**

Performance objective: Disassemble and re-assemble oil burners and identify components

Module 08	Practical		
	Scenario	**Procedure**	**Criteria**
08.08.01	In this scenario, the student will determine which nozzle to use in a particular application. Materials • Water heater • Forced warm air furnace or boiler • Hand tools • Manufacturer's instructions for the supplied appliances	Two different pieces of equipment with different inputs will be employed. The student will examine the equipment and determine the required firing rate, spray angle, spray pattern, and operating pressure. The selected nozzle(s) will be installed and the unit will be test fired. The student will observe the fire and record the observations for discussion later.	The instructor can create checklists for this scenario using format examples from other modules. All work must be performed safely and in a timely fashion. Proper PPE must be selected and properly employed. The correct nozzle must be selected for each application.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s): Modules 1, 2** **Estimated theory hours: 12**

Task: Describe basic electrical theory and concepts.

Module 09	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
09.01.01	Explain basic electrical theory.	Basic concepts of atomic theory and the principles of electrical charges • terms - matter, energy, element, atom, and molecule • three major parts of an atom - electron, neutron, proton • differences between various atoms • Law of Electrical Charges • electrical charge of electrons, protons and neutrons • electron orbits and the valance shell and free electrons • differences between electron flow and conventional flow of electrical energy • electrical induction • electromagnetism • static electricity and safety precautions • electron flow requires an electrical pathway from source back to source or ground
09.02.01	Explain the principles of basic magnetism.	• nature of magnetism and electromagnetism • laws of magnetic attraction and repulsion • electromagnetic induction • methods of producing electromotive force (EMF) • electromagnets and their application ○ solenoid valves ○ relays ○ motors
09.03.01	Explain basic electrical terms and their relationship.	• Electrical terms: Electromotive force, current, resistance • Electrical measurement scales: voltage, amperage, ohms • Ohm's Law to calculate amps, volts, and ohms • Watt's Law to calculate power

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s): Modules 1, 2** **Estimated theory hours: 12**

Task: Describe basic electrical circuit types and components.

Module 09	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
09.04.01	Describe the components of a simple electrical circuit.	Types and fundamentals of operation of each component • sources of potential difference (voltage) • conductors • switches • overload protectors (fuse, cartridge, plug, breaker, time-delay) • loads (resistance) Terms: ○ closed circuit ○ open circuit ○ short circuit ○ dead circuit - physically disconnected at panel ○ complete circuit ○ live circuit
09.04.02	Identify the four types of electrical circuits and their similarities, differences and uses in oil installations.	Four types of electrical circuits • simple circuit (one load) • series circuit • parallel circuit • series-parallel Similarities, differences, and uses of each type of circuit in oil installations.

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s): Modules 1, 2** **Estimated theory hours: 12**

Task: Identify electrical measurement and test instruments.

Module 09	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
09.05.01	Select and explain the use of different electrical measuring and test instruments to test electrical circuits	Describe the types and applications of electrical measuring instruments ○ voltmeter ○ millivolt meter ○ ammeter (in-line and clamp-on) ○ microamp meter ○ ohmmeter / continuity ○ capacitance ○ multimeter (primarily digital but also a brief description of analog meters) • operational instructions associated with each instrument/function • measuring instruments and accessories based on application and measured value • safe limitation and setting for electrical measuring and test instruments • different meters are connected to a simple electrical circuit in different ways to obtain current, voltage, and resistance values • meter readings by value and unit of measurement • care, maintenance and storage of electrical measuring and testing instruments

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s): Modules 1, 2** **Estimated theory hours: 12**

Task: Describe basic electrical theory of alternating current and direct current.

Module 09	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
09.06.01	Explain the theory of single-phase alternating current and direct current.	Differences between direct and alternating current • the phase relationship of voltage and current in a pure resistive circuit • effective values of current and voltage
09.06.02	Explain basic lead/lag alternating current theory with reference to reactance and impedance.	• inductance, counter-electromotive force, induction, and other terms associated with inductors • inductive reactance • the factors that determine inductance • various types of inductors • the properties of inductance in an alternating current circuit • the relationship of voltage and current in a pure inductive circuit
09.06.03	Explain capacitance in alternating current circuits.	• capacitance, farad, and other terms associated with capacitors • capacitive reactance • factors that determine capacitance • various types of capacitors • properties of capacitance in an alternating current circuit • relationship of voltage and current in a pure capacitive circuit

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s): Modules 1, 2** **Estimated theory hours: 12**

Task: Describe the operation and components of electric motors and transformers.

Module 09	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
09.07.01	Explain basic motor types, principles, and features as applicable to OBT-3 work	Motor types: • induction motors: shaded pole, split-phase, permanent split-phase (capacitor start and run capacitor sub-types), multi-speed induction motors • Electronically commutated motors Operating principles and components of each type of motor Motor starting devices - current relays, potential relays, solid state relays, centrifugal switches and capacitor assisted starts Motor overload devices - temperature/current Applications of motors on oil-fired appliances and accessories
09.08.01	Explain transformer basic theory and operation.	Transformer types • step-up transformer in terms of number of turns in primary verses secondary winding, and input-output voltages and currents • step-down transformer in terms of number of turns in primary verses secondary winding, and input/output voltages and currents • auto transformer • transformer ratings • measure voltage across transformers • test transformers with an ohmmeter

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s): Modules 1, 2** **Estimated theory hours: 12**

Task: Identify the regulatory and code requirements governing electrical work at oil installations.

Module 09	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
09.09.01	Explain the training and certification requirements to conduct electrical work at oil installations	Requirements in the Fuel Industry Certifications Regulation 215/01 • OBT-3 certificate holders must always work under the supervision of an OBT-2 or OBT-1 • OBT-3s can only install or service appliance wiring under the direct supervision of an OBT-2 or OBT-1 • OBT-3s can disconnect and reconnect appliance wiring as necessary to conduct annual maintenance on oil-fired appliances with inputs of 2 GPH or less if they have a completed OBT-3 sign-off document for the purpose and are under the general supervision of an OBT-2 or OBT-1 • Only a qualified electrician (i.e, no level of OBT certificate) is authorized to conduct work on building wiring that is subject to the requirements of the Electrical Codes

09.09.02	Recognize the Federal, Provincial, Municipal and general codes and standards affecting electrical work at oil installations.	• Ontario Hydro Inspection
		• Ontario Electrical Safety Code Book verses the Canadian Electrical Safety Code Book
		• the authority for rules governing the installation of electrical equipment
		• legal requirements affecting the connection and disconnection of any electrical equipment
		• requirements for notification of inspecting authority
		• requirements for reconnection of electrical equipment (i.e. permits required)
		• requirements for renovation of existing installation
		• electrical inspection permit
		• Canadian Electrical Code Section 2:
		  ○ Authority for Rules
		  ○ Special Requirements
		  ○ Permits
		  ○ Application for Inspection
		  ○ Fees
		  ○ Posting of Permit
		  ○ Notification for Inspection
		  ○ Use of Approved Equipment·

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s): Modules 1, 2** **Estimated theory hours: 12**

Task: Identify electrical hazards, safe working techniques and procedures.

Module 09	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

09.10.01	Recognize the need for safe working techniques and tool limitations and use requirements as well as the importance of grounding equipment.	• Six factors effecting severity of electrical shock
		  ○ Amount of current
		  ○ Path of travel through the body
		  ○ Condition of the skin
		  ○ Type of voltage – AC or DC
		  ○ Amount of voltage
		  ○ Time duration of shock
		• Identify common electrical safety hazards at OBT worksites and how to avoid them
		• Requirements for and types of personal protective clothing and equipment
		• How to respond to electrical fires
		• How to respond to electrical emergencies

09.10.02	Describe the requirements for lock-out and tagging procedures for electrical equipment.	• proper lock-out and tagging procedures for electrical equipment • reason for proper lock-out and tagging procedures • construction and industry lock-out and tagging procedures

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s)**: Modules 1 and 2 **Estimated practical hours:** 12

Performance objective: Demonstrate ability and knowledge related to magnetism and transformers.

Module 09	Practical		
	Scenario	**Procedure**	**Criteria**
09.11.01	Perform practical experiments related to basic magnetism: • electromagnets ○ coil (i.e., solenoid valve, power supply or pilot safety magnet, energize coil	• place magnets in different positions (i.e., poles together, opposite poles together and observe results • place electromagnet coil and "plungers" on table, energize and observe movement of plungers	○ student to understand principles of magnetism ○ student to understand principles of electromagnets
09.12.01	Establish transformer action experimentally: • observe the effects of varying primary voltages on secondary voltage • observe the differences in primary and secondary windings resistance of various transformers • demonstrate troubleshooting techniques to test transformers Tools and Equipment: ○ step-up transformer ○ step-down transformer ○ variable voltage source A.C. ○ multimeter	• draw the circuit connection diagram to connect transformers to a variable voltage source • connect a step-up transformer to a variable voltage supply • observe and note voltages on secondary compared to primary voltage • connect a step-down transformer to a variable voltage supply • observe and note voltages on secondary compared to primary voltage • disconnect the transformers and test the resistance of each of the transformer's windings • observe and note the resistance values obtained • demonstrate troubleshooting techniques used in testing transformers	○ were safe work practices followed? ○ was the proper PPE selected and properly employed? ○ was the connection diagram drawn correctly? ○ were the voltage readings for step-up and step-down transformers correct? ○ was the electric circuit containing the transformer connected correctly? ○ were the resistance readings for step-up and step-down transformers taken properly and interpreted correctly? ○ were proper troubleshooting techniques used in testing transformers?

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s)**: Modules 1 and 2 **Estimated practical hours:** 12

Performance objective: Demonstrate ability to construct, test, interpret and troubleshoot a simple circuit

Module 09	Practical		
	Scenario	**Procedure**	**Criteria**
09.13.01	Construct a simple electrical circuit and take voltage, current and resistance readings • establish Ohm's Law experimentally for simple electrical circuit using resistance and a variable voltage supply • verify calculated Ohm's Law values with measured electrical circuit quantity • explain the applications of different electrical measuring and test instruments Tools and Equipment: ○ variable voltage supply ○ wire (#14 stranded) ○ 1 SPST switch ○ overload protection (fuse & holder) ○ 2 or 3 loads – preferably pure resistive loads with different resistance values or lamps of different wattage ○ means of safely holding load (e.g. lamp holder) ○ multimeter	• draw a simple circuit diagram • construct a simple circuit • measure current and voltage • measure current on each side of the load • measure voltage drop across a good fuse, a blown fuse, an open switch, a closed switch, the load and at the source • using the measured current and voltage values, calculate the resistance of load • verify calculated resistance values by using an ohmmeter to measure the resistance of the load • if pure resistive loads are not used, explain why calculated resistive reading does not match measured resistive reading • change load to one with higher and/or lower resistance and take current, voltage and resistance readings again • · troubleshoot a simple electrical circuit	○ all terminal connections must be tight ○ circuit wired in a neat manner, wires run at 90-degree angle and secured to board ○ wire must be installed clockwise under terminal screws ○ load must energize when switch is closed ○ all circuit measurements must be accurate ○ calculated values are correct ○ were safe work practices followed in this experiment? ○ was the proper PPE selected and properly employed? ○ were the meters selected, connected and adjusted correctly? ○ were correct troubleshooting techniques used to solve circuit problems

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s)**: Modules 1 and 2 **Estimated practical hours:** 12

Performance objective: Demonstrate ability to construct, test, interpret and troubleshoot a series circuit

Module 09	Practical		
	Scenario	**Procedure**	**Criteria**
09.13.02	Construct a series electrical circuit and take voltage, current and resistance readings • establish Ohm's Law experimentally for simple electrical circuit using resistance and a variable voltage supply • verify calculated Ohm's Law values with measured electrical circuit quantity • explain the applications of different electrical measuring and test instruments Tools and Equipment: ○ variable voltage supply ○ wire (#14 stranded) ○ 1 SPST switch ○ overload protection (fuse & holder) ○ 2 loads – preferably pure resistive loads with different resistance values or lamps of different wattage ○ means of safely holding load (e.g. lamp holder) ○ multimeter ○ wire cutter/stripper	• draw a series circuit diagram • construct a series circuit • measure current and voltage • measure current on each side of each load • measure voltage drop across an open switch, a closed switch, each load and at the source • using the measured current and voltage values, calculate the resistance of each load • verify calculated resistance values by using an ohmmeter to measure the resistance of each load • if pure resistive loads are not used, explain why calculated resistive reading does not match measured resistive reading • troubleshoot a series electrical circuit	○ all terminal connections must be tight ○ circuit wired in a neat manner, wires run at 90-degree angle and secured to board ○ wire must be installed clockwise under terminal screws ○ loads in series must energize dependently on each other ○ all circuit measurements must be accurate ○ calculated values are correct ○ were safe work practices followed in this experiment? ○ was the proper PPE selected and properly employed? ○ were the meters selected, connected and adjusted correctly? ○ were correct troubleshooting techniques used to solve circuit problems

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s)**: Modules 1 and 2 **Estimated practical hours:** 12

Performance objective: Demonstrate ability to construct, test, interpret and troubleshoot a parallel circuit

Module 09	Practical		
	Scenario	**Procedure**	**Criteria**
09.13.03	Construct a parallel electrical circuit and take voltage, current and resistance readings • establish Ohm's Law experimentally for a parallel electrical circuit using resistance and a variable voltage supply • verify calculated Ohm's Law values with measured electrical circuit quantity • explain the applications of different electrical measuring and test instruments Tools and Equipment: ○ variable voltage supply ○ wire (#14 stranded) ○ 3 SPST switches ○ overload protection (fuse & holder) ○ 3 loads – preferably pure resistive loads with different resistance values or lamps of different wattage ○ means of safely holding load (e.g. lamp holder) ○ multimeter ○ wire cutter/stripper·	• draw a parallel circuit diagram with three branch lines • construct a parallel circuit with three branch lines • measure line current and line voltage • measure currents in main supply line to branch lines and in each branch line • measure voltage drop across an open switch, a closed switch, each load and at the source • using the measured current and voltage values, calculate the resistance of each load • verify calculated resistance values by using an ohmmeter to measure the resistance of the loads • if pure resistive loads are not used, explain why calculated resistive reading does not match measured resistive reading • troubleshoot a parallel electrical circuit	○ all terminal connections must be tight ○ circuit wired in a neat manner, wires run at 90-degree angle and secured to board ○ wire must be installed clockwise under terminal screws ○ loads must energize independently with line switch closed ○ all circuit measurements must be accurate ○ calculated values are correct ○ were safe work practices followed in this experiment? ○ was the proper PPE selected and properly employed? ○ were the meters selected, connected and adjusted correctly? ○ were correct troubleshooting techniques used to solve circuit problems

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Electricity **Prerequisite(s)**: Modules 1 and 2 **Estimated practical hours:** 12

Performance objective: Demonstrate ability to construct, test, interpret and troubleshoot a series-parallel circuit

Module 09	Practical		
	Scenario	**Procedure**	**Criteria**
09.13.04	Construct a series-parallel electrical circuit and take voltage, current and resistance readings • establish Ohm's Law experimentally for a series-parallel electrical circuit using resistance and a variable voltage supply • verify calculated Ohm's Law values with measured electrical circuit quantity • explain the applications of different electrical measuring and test instruments Tools and Equipment: ○ variable voltage supply ○ wire (#14 stranded) ○ 3 SPST switches ○ overload protection (fuse & holder) ○ 3 or 4 loads – preferably pure resistive loads with different resistance values or lamps of different wattage ○ means of safely holding load (e.g. lamp holder) ○ multimeter ○ wire cutter/stripper·	• draw a series-parallel circuit diagram with two parallel branch lines and one series branch line • construct a series-parallel circuit with two parallel branch lines and one series branch line branch lines • measure line current and line voltage • measure currents in main supply line to branch lines and in each branch line • measure voltage drop across each load • using the measured current and voltage values, calculate the resistance of each load • verify calculated resistance values by using an ohmmeter to measure the resistance of the loads • if pure resistive loads are not used, explain why calculated resistive reading does not match measured resistive reading • troubleshoot a parallel electrical circuit	○ all terminal connections must be tight ○ circuit wired in a neat manner, wires run at 90-degree angle and secured to board ○ wire must be installed clockwise under terminal screws ○ loads in parallel circuits must energize independently with line switch closed and loads in series must energize dependently on each other ○ all circuit measurements must be accurate ○ calculated values are correct ○ were safe work practices followed in this experiment? ○ was the proper PPE selected and properly employed? ○ were the meters selected, connected and adjusted correctly? ○ were correct troubleshooting techniques used to solve circuit problems

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Controls **Prerequisite(s): Modules 7, 8, 9** **Estimated theory hours: 10**
Task: Describe the basic control terms

Module 10	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
10.01.01	Identify and properly use terms employed in describing controls on oil-fired appliances	Control terms include: • Mechanical controls • Electrical controls • Mechanical/electrical controls • Automatic and manual reset controls • Operating controls • Safety limit controls • Safety circuit • High limit control • Fan/limit control • Auxiliary controls • Switches (Normally open / normally closed, relay, timer) • Controlled device • Primary control / Flame safeguard control • Flame/ignition proving control • Temperature controls • Liquid level controls • Liquid flow controls • Air proving controls • Pressure controls • Position monitoring controls • Motion monitoring controls • Differential setting • Lock-out (soft and hard lockouts) NOTE: Although examples of devices on oil-fired appliances that illustrate the terms should be employed, the purpose is to introduce these terms so more focused discussions can occur on the construction/operation of controls and their role in the sequence of operation.

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Controls **Prerequisite(s): Modules 7, 8, 9** **Estimated theory hours: 10**

Task: Describe the basic sequence of operation and identify the role of controls

Module 10	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

10.02.01	Explain the role of controls in the sequence of operation applicable to a wide variety of oil-fired appliances equipped with pressure atomizing burners.	Normal sequence of operation for a wide variety of oil-fired appliances
		• Call for heat
		  ○ Electrical contacts close on a temperature-sensing operating control (thermostat, aquastat etc.) to activate a motor. The motor may be a:
		  ▪ pump on a hot water boiler or on an air handler on a combo water/space heater
		  ▪ venter motor for a mechanical draft venting system
		  ▪ burner motor if all safety limit controls are proven safe
		• Safety limits are proven
		  ○ Before oil is permitted to flow to the nozzle, all safety control devices must be proven to be in their safe condition. Safety limits include:
		  ▪ Liquid flow proving switches close to prove boiler pumps are operating
		  ▪ Air flow proving devices close to prove that venter motors are operating
		  ▪ High temperature limit controls, filter door position switches, blocked vent controls, and control reset switches are all in their normally closed positions
		  ▪ Flame/ignition sensing device is open proving no flame is present
		• Purge blower and/or timer are activated
		  ○ Mechanically vented appliances may have a timed prepurge cycle to remove combustible gases from the combustion chamber before ignition occurs
		• Combustion blower and fuel unit are activated
		• Oil pressure is delivered to the nozzle
		  ○ Pressure regulating control opens allowing oil to exit the pump at cut-in setting
		  ○ Delay action solenoid valve opens
		• Ignition transformer is energized
		  ○ Happens simultaneously with oil delivery to nozzle
		• Trial for ignition period
		  ○ Primary control incorporates a method of stopping oil flow to the nozzle if a flame or heat in the vent outlet is not sensed within a fixed time period
		  ○ Ignition transformer is de-energized when flame/ignition is proven or after a fixed time period

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Controls **Prerequisite(s): Modules 7, 8, 9** **Estimated theory hours: 10**

Task: Describe the basic sequence of operation and identify the role of controls

Module 10	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
10.02.01 continued	Explain the role of controls in the sequence of operation applicable to a wide variety of oil-fired appliances equipped with pressure atomizing burners. continued	Normal sequence of operation continued • Run cycle ○ Pressure regulating control in fuel unit maintains delivery pressure to nozzle ○ Forced air furnaces employ a temperature sensor outside the heat exchanger that activates the air circulating blower or a timer relay contact closes to energize the air circulating blower • Satisfied call for heat ○ Electrical contacts open on a temperature-sensing operating control (thermostat, aquastat etc.) to stop oil flow to the nozzle. ▪ Usually the burner motor is de-energized which stops the combustion blower and fuel unit from operating ▪ In some cases, a solenoid valve on the outlet of the fuel unit closes stopping oil flow to nozzle but allowing the combustion blower to continue to operate for the post-purge ▪ pressure regulating control closes stopping oil flow from pump at cut-out setting • Post-purge cycle ○ Venter motor continues to operate for a fixed time to remove flue gases from combustion chamber and vent ○ In cases where the combustion blower is used for purging, the blower continues to operate for a fixed time without oil flowing to nozzle • Heat distribution system is de-energized ○ For forced air heating systems, a temperature sensing switch opens to de-energize the circulating air blower when the temperature falls below a set temperature, or a timer relay contact opens to de-energize the air circulating blower ○ For boilers and combo water/space heaters. a timer relay contact opens to de-energize the circulating pump after a fixed time period

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Controls **Prerequisite(s): Modules 7, 8, 9** **Estimated theory hours: 10**

Task: Describe the basic fundamentals of controls

Module 10	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
10.03.01	Identify operating principles, function and normal location of control types employed on oil-fired appliances	Control types include: • Temperature controls ○ Metallic ○ Bi-metallic ○ Bulb and bellows ○ Resistance (resistance temperature detectors / PTC and thermistor / NTC) ○ Used as thermostats, aquastats, high limits, circulating air fan operating controls, outdoor temperature sensors, blocked vent switches, motor thermal overload, stack relay sensor, fuses, circuit breakers, fusible links, safety switch heater resets • Liquid level controls ○ Float ○ Conductivity (Probe type) ○ Used on boilers to prove safe level of water and in constant level valves to control oil level and feed rate • Liquid flow controls ○ Mechanical paddle types ○ Used on boilers to prove sufficient water flow • Air proving controls ○ Diaphragm types ▪ Designed/employed to sense negative or positive pressure or both (differential) ○ Used to prove that a mechanical air moving device is moving sufficient air • Pressure controls ○ Balance gate e.g. draft regulator ○ Spring-operated relief valves ○ Pressure regulators ○ Used as relief valves on boilers / water heaters, to set safe cut-in and cut-out oil pressures to the nozzle, maintain proper oil pressure to the nozzle

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Controls **Prerequisite(s): Modules 7, 8, 9** **Estimated theory hours: 10**

Task: Describe the basic fundamentals of controls

Module 10	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
10.03.01 continued	Identify operating principles, function and normal location of control types employed on oil-fired appliances. continued	Control types continued: • Position monitoring controls ○ Mechanical ○ Magnetic ○ mercury ○ Used to prove that air filter door is closed, hinged burner mounting plate is closed, vent or air supply dampers are open, upright position of construction heaters • Motion sensing controls ○ centrifugal switches - used in some motors to de-energize the start windings ○ Hall-effect switches – used on some motors to prove operation and/or rpm • Flame/ignition proving control ○ Light sensors / cadmium sulphide cells ○ Bi-metallic heat sensors / stack relays ○ Used to prove that a flame is established and maintained throughout the run cycle • Primary control / Flame safeguard control ○ Electromechanical relays (stack relay controls) ○ Electronic relays (cad cell relay controls) ○ Used to control burner operation within safety limits

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Controls **Prerequisite(s): Modules 7, 8, 9** **Estimated theory hours: 10**

Task: Describe the procedures required to maintain, test, and reset stack relay primary controls

Module 10	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
10.04.01	Identify basic maintenance, test, and reset procedures for stack relay primary controls as applicable to the OBT-3 scope of certificate.	Stack relay primary control • Maintenance as per manufacturer's instructions ○ Remove from vent connector ○ Inspect condition of wires, contacts, terminals, bi-metallic heat sensor ○ Clean if required and reinstall ensuring that device is properly located and positioned • Test as per manufacturer's instructions ○ Test trial for ignition function by providing a normal call for heat to activate the burner while preventing oil delivery to the nozzle and ensure that burner shuts off within the time specified by the appliance manufacturer ○ Test the flame failure response function by cutting off the fuel delivery to the nozzle during the burner run period and ensure that the burner shuts down within the time specified by the appliance manufacturer • Reset as per manufacturer's instructions ○ Before resetting a primary control, take reasonable actions to determine the cause of the lockout and whether oil has accumulated in the combustion chamber ○ After heat has dissipated from the vent and/or safety switch heater, move the reset lever or button to the operating position

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Controls **Prerequisite(s): Modules 7, 8, 9** **Estimated theory hours: 10**

Task: Describe the procedures required to maintain, test, and reset cad cell relay primary controls

Module 10	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
10.04.02	Identify basic maintenance, test, and reset procedures for cad cell primary controls as applicable to the OBT-3 scope of certificate.	Cad cell relay primary control • Maintenance as per manufacturer's instructions ○ Inspect condition of wires and terminals ○ Clean the cad cell • Test as per manufacturer's instructions ○ Test trial for ignition function by providing a normal call for heat to activate the burner while preventing oil delivery to the nozzle and ensure that burner shuts off within the time specified by the appliance manufacturer ○ Test the flame failure response function by cutting off the fuel delivery to the nozzle during the burner run period and ensure that the burner shuts down within the time specified by the appliance manufacturer • Reset as per manufacturer's instructions ○ Before resetting a primary control, take reasonable actions to determine the cause of the lockout and whether oil has accumulated in the combustion chamber ○ After heat has dissipated from the safety switch heater, push the reset button ○ Some modern primary controls will have a limited number of trial for ignition failures or flame failure failures before going into a hard lock out which requires an addition reset procedure as specified by the manufacturer

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Controls **Prerequisite(s): Modules 7, 8, 9** **Estimated practical hours: 8**

Performance objective: Determine the sequence of operation for an appliance and the control devices employed on the appliance.

Module 10	Practical		
	Scenario	**Procedure**	**Criteria**
10.05.01	In this scenario, the student will determine the sequence of operation of a functioning appliance in the shop and identify the control devices and their purpose. An optional additional related exercise is for the student to identify various control devices displayed by the instructor Materials: • Fully functional operating appliance and manufacturer's instructions • For the optional exercise, control devices found on other oil-fired appliances than the one used in the first scenario should be displayed.	The student will watch the oil-fired appliance operate through numerous cycles and read the manufacturer's instructions to determine the sequence of operation and types of controls used on the appliance. If the optional additional exercise is conducted, the student can examine and read the manufacturer's literature for each control displayed and answer questions related to the type, principle of operation, function, and normal location of each control.	The instructor can create checklists for this scenario using format examples from other modules. Criteria for evaluation: Student must correctly identify the sequence of operation using proper control terms. Student must correctly identify the controls employed on the appliance along with its principle of operation and function using proper control terms. For the optional exercise, the student must correctly identify each control type displayed along with its principle of operation, function, and normal location on an appliance using proper control terms.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Controls **Prerequisite(s): Modules 7, 8, 9** **Estimated practical hours: 8**

Performance objective: Connect single phase motors using external starting and overload protection devices.

Module 10	Practical		
	Scenario	**Procedure**	**Criteria**
10.06.01	The student will conduct a trial for ignition (TFI) test and flame failure response (FFR) test along with soft and hard lockout resets of a primary control on a functioning appliance. Maintenance of the primary control may be conducted during this exercise or during the Module 14 labs on annual maintenance. Materials: • Fully functional operating appliance • Appliance and primary control manufacturer's instructions	The instructor will demonstrate how to conduct a TFI test and FFR test along with soft and hard lockout resets of a primary control on a functioning appliance. The potential dangers of resetting a primary control too many times must be clearly identified (i.e. oil flooded combustion chamber). The student will repeat the TFI test and FFR test along with soft and hard lockout resets of a primary control on a functioning appliance.	Guidelines for evaluation is as follows: All work must be performed safely and in a timely fashion. Proper PPE must be selected and properly employed. Tools must be used properly and all tests must be performed properly. The student must determine if the TFI timing and FFR timing meet timing limits given in manufacturer's instructions.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Air Supply and Venting **Prerequisite(s): Modules 7 and 8** **Estimated theory hours: 6**

Task: Describe purpose and interconnection of venting and air supply and then types of vent materials

Module 11	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
11.01.01	Describe the purpose of venting and air supply for oil-fired appliance installations.	Define the terms “venting” and “air supply” • how they are connected • need to vent products of combustion including water vapour to the outdoors to prevent health problems for the occupants and structural damage to the building • need to replace the air consumed in combustion and venting
11.02.01	Describe different types of vent materials.	• masonry chimneys must be clay-tile or transit-lined and meet Building Code o usually lined with a stainless-steel flexible or rigid chimney liner • factory-built metal chimneys – Classes and purpose/application o A – double-wall stainless steel with insulation between walls – some types are not approved for use with oil-fired appliances ▪ clearance to combustibles varies from 1” to 3” o B – double-walled with aluminium interior wall and galvanized outer wall. Not approved for use with oil-fired appliances o L – double-walled with stainless-steel interior wall and galvanized outer wall. Approved for use with some oil-fired appliances as indicated on the rating plate ▪ clearance to combustibles is usually 3” o C – single-wall galvanized or black steel pipe only approved for use only as a vent connector on some natural draft vented appliances ▪ clearance to combustibles is usually 9” but may be 18” in some cases ▪ usually galvanized but black stove pipe required for wood/oil appliances o BH – special venting system approved for use with the appliance. May be plastic or metal ▪ clearance to combustibles specified by appliance and vent manufacturer • draft control device o define terms: barometric damper / draft regulator, dilution air o identify construction and where it is located in some vent systems NOTE: only a general overview of types and purpose is required so an OBT-3 can identify types and problems since an OBT-3 is not authorized to install venting.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Air Supply and Venting **Prerequisite(s): Modules 7 and 8** **Estimated theory hours: 6**

Task: Describe types of draft and factors affecting each type

Module 11	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

11.03.01	Describe the types of draft and the factors affecting each type	Natural draft
		• temperature difference inside vent and outside building
		• appliance and vent are under negative pressure
		• usually requires draft control device which consumes more indoor air
		• factors affecting natural draft:
		  ○ temperature of the flue gases
		  ○ temperature of the outside air
		  ○ barometric pressure
		  ○ vent and vent connector material, size, height, configuration, and location
		  ○ wind - currential draft causing suction or downdraft causing positive pressure and spillage
		
		Mechanical draft
		• induced
		  ○ mechanically created
		  ○ negative pressure at appliance and upstream of the induced draft fan
		  ○ fan located downstream of appliance in venting system or at termination
		  ○ usually requires draft control device which consumes more indoor air
		• forced
		  ○ mechanically created
		  ○ creates positive pressure in the appliance and vent
		  ○ located upstream of the appliance
		• factors affecting mechanical draft:
		  ○ less susceptible to spillage as long as vent system is gas-tight
		  ○ vent and vent connector material, size, height, configuration, and location.
		  ○ Does not require draft control device that consumes indoor air
		  ○ wind - currential draft causes suction in vent or positive pressure reducing fan capability
		
		Combination of natural draft and mechanical draft
		• forced draft through the appliance and natural or fan assist draft from the appliance outlet
		• appliance under positive pressure and vent are under negative pressure
		• usually requires draft control device which consumes more indoor air

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Air Supply and Venting **Prerequisite(s): Modules 7 and 8** **Estimated theory hours: 6**

Task: Describe types of air supply and factors affecting each type

Module 11	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

11.04.01	Describe the types of air supply and the factors affecting each type	Three types of air supply:
		• indoor air used for combustion and dilution air
		  ○ removes a significant amount of heated air from the building lowering overall efficiency
		  ○ outdoor air openings required
		  ○ building pressure problems may adversely affect appliance operation
		  ○ most commonly used air supply system for oil-fired appliances
		• direct ducting of outside air to the burner and no dilution air used
		  ○ must be installed as approved in the appliance manufacturer's certified instructions
		  ○ changes in outside air temperature may affect combustion
		  ○ building pressure problems will not affect appliance operation
		• direct ducting of outside air to the burner and dilution air used to control venting
		  ○ must be installed as approved in the appliance manufacturer's certified instructions
		  ○ changes in outside air temperature may affect combustion
		  ○ building pressure problems may adversely affect appliance operation
		  ○ outdoor air openings required

11.04.02	Describe signs of venting and air supply problems	Signs include: • heat, moisture, or soot stains at vent joints or combustion chamber inspection door • incomplete combustion • noisy or faulty ignition • flue gas or oil odours in building • high flue gas temperatures • signs of elevated levels of CO in building (e.g. CO alarm, health problems, etc.)

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Air Supply and Venting **Prerequisite(s): Modules 7 and 8** **Estimated theory hours: 6**

Task: Describe the procedure to measure draft.

Module 11	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
11.05.01	Describe the procedure to measure draft.	overfire draft • as per manufacturer's specifications • typically taken through an access port into the combustion chamber • reset gauge to zero before inserting in sampling port • take reading 1/100 inches of water column (w.c.) or pascals breech draft • as per manufacturer's specifications • drill 1/4" hole in vent connector upstream of draft control device on negative venting systems • reset draft gauge to zero before inserting in sampling port • take reading 1/100 inches of water column (w.c.) or pascals draft loss • difference between overfire draft and breech draft • high draft loss indicates plugged or cracked heat exchanger purpose of taking draft readings • to determine if there is sufficient draft for the appliance • to determine cleanliness and integrity of the heat exchanger

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Air Supply and Venting **Prerequisite(s): Modules 7 and 8** **Estimated theory hours: 8**

Task: Explain purpose and operation of draft regulators

Module 11	Enabling Objectives: The student will be able to:	Theory Content
11.06.01	Explain purpose and importance of draft regulators.	Purpose of draft regulator in natural draft venting systems • to reduce draft below maximum available draft (cannot increase draft beyond available draft) • to overcome adverse draft conditions • to ensure consistent burner operating efficiency Purpose of draft regulator in induced draft venting systems • to reduce suction in appliance created by fan • to ensure consistent burner operating efficiency Factors that change natural draft • temperature change in the appliance • temperature change in outside air • atmospheric pressure change • changes in wind conditions

11.06.02	Explain principle of operation of draft regulator.	Principle of operation
		• opens or closes automatically in response to vent pressure changes to maintain consistent overfire draft condition
		  ○ opens to reduce draft
		  ○ closes to increase draft to maximum available draft (cannot increase beyond that)
		• located on vent connector between chimney base and appliance as per manufacturer's specifications
		• hinged gate with adjustable over-center weight
		• hinge must be level horizontal to floor and gate must be perpendicular to floor
		• single-acting for oil appliances and double-acting for gas appliances

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Air Supply and Venting **Prerequisite(s): Modules 7 and 8** **Estimated practical hours: 4**

Performance objective: Identify vent material types and venting/air supply problems

Module 11	Practical		
	Scenario	**Procedure**	**Criteria**
11.07.01	In this scenario, the student will identify different types of venting materials as displayed or shown by the instructor. Displayed vent materials should include: • Types A, L, C, and BH (plastic and AL-29-4C) • Section of clay-tile and metal liner (photographs may be used) • Draft regulator	The instructor will display various types of venting materials and ask the student to identify each type and where/when it is used (I.e. with what type of draft system and where in the system).	The instructor can create checklists for this scenario using format examples from other modules. Student must correctly identify the type of vent material and where/when it is employed
11.07.02	In this scenario, the student will identify venting or air supply problems as displayed or shown by the instructor. Displayed or shown venting or air supply problems should include: • Corroded vents • Heat damaged vents • Obstructed vents • Improperly installed draft regulator • Soot stains around burner mounting plate or inspection door or vent joints • Appliances in confined areas without air supply openings	The instructor will display or show in photographs/videos venting or air supply problems at various installations and ask the student to identify the problem and provide probable causes and appropriate action to take.	The instructor can create checklists for this scenario using format examples from other modules. Student must correctly identify the problem and provide reasonable and thoughtful probable causes and appropriate action to take.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Introduction to Air Supply and Venting **Prerequisite(s): Modules 7 and 8** **Estimated practical hours: 4**

Performance objective: Take draft readings and adjust a draft regulator to meet manufacturer's specifications and interpret draft readings

Module 11	Practical		
	Scenario	**Procedure**	**Criteria**
11.08.01	In this scenario, the instructor will demonstrate how to take draft readings and adjust a draft regulator to achieve the draft readings required for the appliance. The student will repeat the procedures as part of this exercise or in Module 12 exercises on combustion set-up and/or Module 14 exercises on annual maintenance.	The instructor will demonstrate how to take draft readings and adjust a draft regulator on an operating natural draft appliance. The student will repeat the procedures as part of this exercise or in Modules 12 exercises on combustion set-up and/or Module 14 exercises on annual maintenance.	The instructor can create checklists for this scenario using format examples from other modules. Student must correctly identify the type of vent material and where/when it is employed Proper PPE must be selected and properly employed.
11.08.02	In this scenario, the instructor will either demonstrate and/or present written examples of improper overfire and/or breech draft readings and ask the student to provide probable causes and appropriate action to take. Improper readings should include: • High overfire and breech draft readings • High overfire and normal breech draft readings • Positive overfire and normal breech draft readings • Draft readings that change when the air circulating blower on a forced air furnace is activated.	Improper overfire and/or breech draft readings will either be demonstrated or presented in written examples and the student will be asked to identify whether the draft readings are appropriate for the appliance and, if not, to provide probable causes and appropriate action to take.	The instructor can create checklists for this scenario using format examples from other modules. Student must correctly identify whether the draft readings are appropriate for the appliance and, if not, provide reasonable and thoughtful probable causes and appropriate action to take.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Combustion Theory and Analysis **Prerequisite(s) Modules 3, 4, 8, and 11** **Estimated theory hours: 6**

Task: Explain combustion basics

Module 12	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
12.01.01	Define combustion and the requirements for combustion .	Definition of combustion – rapid oxidization of a fuel creating heat and light Fire triangle • fuel • oxygen (air) • ignition heat Requirements for fuel oil combustion • fuel oil liquid must be vaporized (i.e. liquid fuel does not burn) • sustained combustion requires that the liquid temperature be raised above the fire point • intimate oil vapour/air mixing is best achieved with mechanical combustion air surrounding droplets of oil
12.01.02	Identify types of combustion	Types of combustion • perfect combustion – theoretical concept used to compare with actual combustion readings • complete combustion – chemical reaction of carbon atoms and oxygen to create CO_2 and hydrogen atoms with oxygen to create H_2O with no (or minimal) CO, C, or unburned fuel • incomplete combustion - chemical reaction not completed resulting in unacceptable levels of CO, soot, and/or unburned fuel.
12.01.03	List the products of combustion	Names and designation • CO_2 • H_2O • heat • light • sulphur • carbon (soot/smoke) • CO • O_2 / N^2

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Combustion Theory and Analysis **Prerequisite(s) Modules 3, 4, 8, and 11** **Estimated theory hours: 6**

Task: Explain requirements for complete combustion for burner types and combustion chamber types

Module 12	**Learning Objectives: Upon successful completion, the student will be able to:**	**Theory**
		Content
12.02.01	Describe condition for good combustion	Function of the burner • atomization of fuel oil • air fuel mixing Function of the chamber • provide air for combustion • maintain high temperature environment • protection of heat exchanger
12.02.02	Describe combustion chamber design and materials.	Combustion chamber material • fire brick, heavy, light duty • cerafelt, dry type, wet type Combustion chamber design • shape and application of round, square, rectangular, wingwall Sizing factors • type of spray • burner requirements • gallonage of nozzle • angle of spray Sizing combustion chamber • firing rate • manufacturer's specifications • measurements of combustion area

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Combustion Theory and Analysis **Prerequisite(s) Modules 3, 4, 8, and 11** **Estimated theory hours: 6**

Task: Identify and select specialty test instruments

Module 12	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content

12.03.01	Identify and select specialty testing instruments.	Select test instruments and describe their applications
		• CO_2 / O_2 / CO analysers
		  ○ electronic devices
		  ○ orsat (fyrite) devices
		• smoke tester - mechanical and electronic
		• draft gauges - mechanical and electronic
		• temperature gauges - mechanical and electronic
		• pressure gauges - - mechanical and electronic

12.03.02	List procedures for proper care, use, handling, storage, and calibration of testing instruments.	• check hose condition • check filters on analyzer and smoke tester • select proper fuel for electronic analyzers • check battery level for electronic devices • zero calibration of instruments in fresh air • manufacturer's requirements for calibration • manufacturer's requirements for operating temperature • manufacturer's requirements for storage
12.03.03	Describe combustion efficiency	• measure the effectiveness of the combustion process • effectiveness in transferring heat energy of burner to the heated medium • steady state thermal efficiency based on formula using CO_2 or O_2 reading and net stack temperature • flue gas analysis determines efficiency of combustion process

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Combustion Theory and Analysis **Prerequisite(s) Modules 3, 4, 8, and 11** **Estimated theory hours: 6**

Task: Conduct a flue gas analysis

Module 12	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
12.04.01	Describe the procedure to perform combustion efficiency tests	Tools equipment, CO_2 / O_2 / CO analyser, stack temperature thermometer, draft gauge, smoke tester, efficiency calculator/software, pressure gauges Procedure • ensure all instruments are zero adjusted and in good, reliable condition • activate appliance and assess ignition characteristics • assess flame condition and adjust air as required • run appliance for 5 minutes or until stack temperature stabilizes • determine if sampling ports are properly located • check pump pressure or flow rate to meet manufacturer's specifications • take overfire draft reading, if possible, and adjust draft regulator to meet manufacturer's specifications • take breech draft reading to either compare with the overfire draft or, if no overfire draft reading/adjustments were made, to adjust draft regulator to meet manufacturer's specifications • take smoke test reading and adjust air as required • take flue gas sample with CO_2 / O_2 / CO analyser and adjust air as required • take flue gas temperature and calculate net stack temperature • calculate efficiency (automatically with electronic devices or using a manual efficiency calculator) • shutdown and reactivate appliance to ensure proper ignition • leave appliance in safe operating condition and in compliance with code requirements and manufacturer's specifications
12.04.02	Identify, interpret, and apply requirements in the B139 Code and manufacturer's instructions regarding flue gas analysis	• When and where to take flue gas tests • Maximum smoke readings allowed by code • Maximum flue gas temperature allowed by code • Requirement to meet manufacturer's instructions for draft, CO_2 / O_2 / CO

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Combustion Theory and Analysis **Prerequisite(s) Modules 3, 4, 8, and 11** **Estimated practical hours: 6**

Module 12	Practical		
	Scenario	**Procedure**	**Criteria**
12.05.01	This exercise will determine the student's ability to identify, assess, and interpret the theoretical information presented in this Module regarding combustion chambers. Materials: • a functioning appliance • appliance installation instructions • tape measure • inspection mirror • hand tools	Before firing the appliance, the student will identify the type of combustion chamber, assess the condition of the combustion chamber, and determine whether the size and shape are theoretically appropriate for the firing rate and nozzle information given on the rating plate. While firing the burner, the student will assess whether the installed nozzle is appropriate for the application. If problems with combustion are identified, the student must recommend possible corrective action.	The student must: • Proper PPE must be selected and properly employed. • Correctly identify the type of combustion chamber • Provide reasons for his/her assessment of the combustion chamber including measurement calculations and corrective actions if problems are found with the chamber condition. • Provide reasons for his/her assessment of whether the installed nozzle is appropriate for the application. If problems with combustion are identified, the student must recommend reasonable corrective action(s).
12.06.01	In this scenario the student will conduct a combustion analysis and adjust the combustion efficiency of an appliance. Materials • Operational appliance with instructions • Combustion efficiency test equipment complete with instructions • Hand tools	The teacher will demonstrate where and how to take the various tests required and show how to determine and analyse the results to meet code and manufacturer's requirements. The student will repeat the procedures on a different appliance and adjust the efficiency to meet code and manufacturer's requirements. More than one of these exercises should be completed with safe combustion faults created by the instructor in some of the exercises.	The teacher can create checklists for this scenario using format examples from other modules. All work must be performed safely and in a timely fashion. Proper PPE must be selected and properly employed. Tools must be used properly, and all tests must be performed. Final set up must meet code requirements and manufacturer's specifications.

Performance objective: Assess combustion chamber and conduct a combustion analysis and set-up

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Technical Manuals, Specifications, Schematics, Drawings and Graphs

Prerequisite(s): Modules 4 to 12 **Estimated theory hours:** 4

Task: Utilize Reference Materials

Module 13	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
13.01.01	Locate specific information in reference materials.	B139 Code and Standards • locate part applicable to a specific type of installation (e.g. large installations, residential and small commercial installations, engines, construction heaters, portable equipment) • within each part of the code, locate requirements specific to a type of equipment (e.g. indoor tanks, vent connectors, leak testing, portable equipment, etc.) • accessing, interpreting and applying the Ontario amendments in the C.A.D • how to access equipment standards and approval status on the internet and determine reliability of the information Manufacturer's instructions • distinction between certified and non-certified instructions • distinction between installation instructions and operating/servicing instructions • determine whether the instructions are applicable to the equipment • locating proper information/diagram/table for a particular model or size of unit for instructions that apply to multiple units • how to access manufacturer's instructions on the internet and determine reliability of the information Service Bulletins (i.e. reports on special problems, field repairs) • importance and use of service bulletins with examples • how to access service bulletins on the internet and determine reliability of the information Director Orders and Safety Bulletins • identify who issues orders and bulletins and requirements to comply • review pertinent examples • how to access Director Orders and Safety Bulletins on the internet and determine reliability of the information Other reference material • training manuals and internet resources applicable to oil installations

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Technical Manuals, Specifications, Schematics, Drawings and Graphs

Prerequisite(s): Modules 4 to 12 **Estimated theory hours:** 4

Task: Interpret Technical Manuals and Manufacturers' Specifications

Module 13	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
13.02.01	Select data on service (troubleshooting) charts.	Define following terms and their importance using examples • sequence of operation • symptoms • causes • corrective action Note: Some parts are not to be field adjusted
13.02.02	Identify and interpret data for the selection, sizing or checking of specific components covered in manufacturer's installation instructions.	Identify and interpret common information found in manufacturer's instructions • specialty tools and hardware • piping requirements and diagrams • wiring requirements and diagrams • vent sizing tables and diagrams • parts diagram and list • importance of using proper MODEL # when looking up parts and notes that effect changes in numbers

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Technical Manuals, Specifications, Schematics, Drawings and Graphs

Prerequisite(s): Modules 4 to 12 **Estimated theory hours: 4**

Task: Interpret Mechanical Drawings and Specifications

Module 13	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
13.03.01	Distinguish between various lines used in drawings.	Lines on equipment diagrams • common symbols • field installed wiring • factory wiring • optional factory wiring • connecting lines that show mechanical connection
13.03.02	Identify different types of drawings and components of drawings.	Orthographic projections • shows object from many angles • most detailed drawings are of this type • give example of various types applicable to oil installations Detailed parts and assembly drawings • assists in the identification of and ordering replacement parts for an appliance • assists in the assembly and disassembly of appliance Pictorial drawings • shows location of various components in relation to other components Schematic drawings • shows sequence of operation • used for troubleshooting Some diagrams are a combination of pictorial and schematic diagrams

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Technical Manuals, Specifications, Schematics, Drawings and Graphs

Prerequisite(s): Modules 4 to 12 **Estimated theory hours: 4**

Task: Interpret Mechanical Drawings and Specifications

Module 13	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
13.03.02 continued	Identify different types of drawings and components of drawings.	Wiring Diagrams • usually show wire connections/colours/terminal location etc. • wiring layout can be determined • expected voltage is often given or can be determined Specifications • size of area needed for installation • height requirements • size of piping/venting • model number Bill of Material • materials can be calculated Parts List • proper parts substitution can be accomplished Changes and Updates • importance of accessing and reading service bulletins and manufacturers' literature Scale and units of measurement • importance of determining and interpreting the scale employed in the diagram • importance of determining units of measurement employed in the diagram • use of conversion tables/formulas/software to change scale and units of measurement

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Technical Manuals, Specifications, Schematics, Drawings and Graphs

Prerequisite(s): Modules 4 to 12 **Estimated theory hours: 4**

Task: Interpret Technical Manuals and Manufacturers Specifications

Module 13	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
13.04.01	Identify types of graphs, charts, and tables.	Types include· • bar charts • pie charts • x-y graphs • sizing tables Identify the various applications Identify the advantages (e.g. ease of reading) Identify the advantages (e.g. accuracy and applicability to specific task)
13.04.02	Locate and interpret data on graphs, charts, and tables.	Locate and interpret • graph axis • scales • labels on the graphs • graph titles • additional notes

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Technical Manuals, Specifications, Schematics, Drawings and Graphs

Prerequisite(s): Modules 4 to 12 **Estimated practical hours:** 2

Performance objective: Interpret mechanical drawings and specifications.

Module 13	Practical		
	Scenario	**Procedure**	**Criteria**
13.05.01	The student will read and interpret manufacturer's instructions for a specific appliance to answer questions related to the appliance. The instructor is to provide access to a manufacturer's certified installation instruction for a commonly encountered oil-fired forced air furnace and specify the model, input, and other distinguishing features that apply for this exercise	Based on the provided manufacturer's instructions and specific appliance requirements the student must identify the location of (page # or table/diagram title) and interpret the following information • dimensions of the appliance (H, W, L) • nozzle size and features • required pump pressure • air supply requirements • vent type, size, and configuration requirements • clearance to combustible requirements • recommended and maximum temperature rise across the heat exchanger • sequence of operation • safety timings • approved replacement part (make and model) for the primary safety control • list recommended corrective action(s) when the high temperature limit trips • other information as specified by the instructor	The student must correctly identify the location of (page # or table/diagram title) and correctly interpret the information specified in the procedure column.

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Customer Relations **Prerequisite(s)**: None **Estimated theory hours**: 2

Task: Respond to customer inquiries

Module 15	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
15.01.01	Explain professional behaviour and attitude to be expected by customers, while in their presence, homes & institutions regarding various issues.	Unacceptable behaviour such as: • smoking/vaping • horseplay • harassment • profanity • criticizing customer's home and belongings • criticizing other trade related contractors • criticizing equipment manufacturers
15.01.02	Recognize when customers should be referred to senior personnel.	Companies advise technicians to refer all non-technical questions to the office (e.g. terms of contract and warranty issues)
15.01.03	Demonstrate active listening and clarifying techniques	Methods for listening to customers' questions and concerns • use strategies such as eye contact and note-taking to maintain your focus on customer's comments • if necessary, move to a location free of noise & other distractions to talk with customer • avoid interrupting customer -- show patience by letting customer complete sentences and explanation before responding • make notes to pass on to supervisor • paraphrase customer's explanation of problem/request to clarify your understanding • acknowledge customer's concerns • be sympathetic to customer's situation or complaint • seek clarification on points raised so that correct information can be passed on • use lay person's vocabulary to answer customer inquiries and check for customer understanding before going on to a new topic • ensure customer agrees to corrective action before work commences • provide identification if requested, including your OBT certificate. • use TSS Act, Regulations and code book to provide clarification

Module Title: Customer Relations **Prerequisite(s)**: None **Estimated theory hours**: 2

Task: Prevent property damage.

Module 15	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
15.02.01	Describe common ways in which property damage can be prevented.	Parking on street if possible • will not damage customers belongings · toys, bicycles, landscaping etc. • engine oil leakage will not ruin customer's driveway • driveway free for customer • children less likely to enter or damage the vehicle especially if it is locked Dirty hands and clothes ○ presents a poor visual impression of both the company and the technician ○ damages customer's paint and furnishings ○ dirty footwear damages customer's carpeting and floors ○ wear outer footwear – i.e.: Booties (work boot covers) which are easily removed, and safety boots can still be worn in the home Tools and equipment • do not place tools and equipment on customer's appliances or any other objects which may be damaged e.g. magnetic flashlights and tools will scratch appliances • use trays and pads to protect floors, appliances, and furnishings • ensure the appliance(s) will fit into the spaces provided before starting the job • do not leave trouble lights turned on and lying on floors or near flammable material • do not leave unattended torches burning • keep fire extinguisher at hand • never unplug the customer's refrigerator or freezer to obtain power for tools

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Customer Relations **Prerequisite(s)**: None **Estimated theory hours**: 2

Task: Prevent property damage.

Module 15	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
15.02.02	Demonstrate how to move appliances and equipment without damaging the work area.	• use protective pads on floors under appliances so appliances can be moved without damaging floor • “walk” appliances to prevent damaging floors and walls • use cart to move appliance when necessary (stairs)
15.02.03	Clean up work area/spills and remove all debris and cleaning materials	• clean up spills immediately • use solvents only if they will not cause further damage • remove rags and cloths • clean up excess solder and flux • remove all crating and packaging • report all damage immediately to customer and supervisor
15.02.04	Outline the safety/liability concerns associated with using a customer’s tools	Customer’s tools: • may be of inferior quality and might break during use leading to liability and will have to be replaced • may be lost and will have to be replaced • can lead to personal injury • shows a lack of professionalism with client

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Customer Relations **Prerequisite(s)**: None **Estimated theory hours**: 2

Task: Respond to irate customers

Module 15	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
15.03.01	Outline methods for coping with irate customers, how to identify different types of hostile customers and techniques for reducing their dissatisfaction.	• use active listening and clarifying techniques to clarify nature of complaint • let customer finish talking -- do not interrupt • restate nature of complaint • focus on the problem, not the customer • offer an explanation of how the problem occurred, taking responsibility where appropriate • where a customer has caused the problem, explain the nature of the problem neutrally, focusing on the problem rather than the customer's error • identify an appropriate solution to the problem (extra work, exchange, refund, referral to a senior crew member) consistent with company standards and policies • check with irate customer to ensure proposed solution is acceptable and have customer sign authorization before starting work • do follow-up when solution has been completed to ensure customer satisfaction • determine which kind of customer you're dealing with … a customer with a legitimate complaint, a customer with a minor problem or a major problem, or a customer who exhibits traits of "difficulty": an attention-getter, a whiner, a manipulator, etc. • use listening techniques appropriate to the hostile customer such as reinforcing, fogging, empathizing, or summarizing • determine whether the customer is most interested in immediate action, in having someone listen to him/her, etc., and respond appropriately • in all discussions, focus on the problem and its solution and not on the people involved, either customers or company representatives • do not agree with or encourage customer when he/she criticizes your company • identify the cause of hostility and restate for customer to show your understanding • propose a solution and discuss it with customer • implement the solution and check with customer for satisfaction • do follow-up to ensure solution is still satisfactory after an appropriate period of time

OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Customer Relations **Prerequisite(s)**: None **Estimated theory hours**: 2

Task: Demonstrate sensitivity to cultural differences

Module 15	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
15.04.01	Identify personal perceptions and misperceptions regarding cultural differences	• definition of culture (including cultural use of space and time; religious history and practices; values related to work, property, family, and home; political values and history; values and expectations related to gender roles, dress, respect for others; traditional foods and excluded foods and beverages) • barriers to cross-cultural communication, including language, non-verbal communication patterns, stereotyping, and value systems • strategies for overcoming barriers to cross-cultural communication, including identifying perceptions, checking perceptions by stating them and seeking confirmation or clarification, and adjusting communication style to meet the needs of the other participant • common misperceptions of various cultures • self-awareness exercises
15.04.02	Define strategies for attending to cultural differences (as they apply to work performed) regarding work issues.	Issues such as: • timelines and scheduling of work • contractual details and consent • payment terms and procedures • expectations regarding service interruptions and delays • access to property Strategies such as: ○ clarify work plan and customer expectations prior to beginning work ○ explain company procedures and policies and check for understanding and agreement prior to beginning work ○ validate perceptions by paraphrasing customer's objections if problems arise ○ adjust work plan timelines and schedule to respect cultural or religious practices ○ observe rules of customer's business or home with respect to appropriate language and (where safety permits) attire

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Customer Relations **Prerequisite(s)**: None **Estimated hours**: 2

Task: Complete jobs according to policies and regulations.

Module 15	Learning Objectives: Upon successful completion, the student will be able to:	Theory Content
15.05.01	Describe the scope of work that can legitimately be performed under different licences.	• Oil Burner Technician 1 • Oil Burner Technician 2 • Oil Burner Technician 3 • Oil Burner Activation Technician • Oil Pipefitter
15.05.02	Identify situations where work must be referred to other trades, supervisors or other Oil Burner Technicians	Trades limitations such as: • electrical, plumbing, sheet metal, refrigeration, etc • warranty claims by customers Other technicians ○ inputs greater than permitted by technician's license ○ technician unsure of how to proceed safely ○ Technicians under direct and indirect supervision, i.e. OBT3 supervised by OBT2 or OBT1
15.06.01	Identify situations where it is not advisable to enter the customer's premises	Technicians should not put themselves in situations that invite criticism or create misunderstandings • ensure that personal and company reputations cannot be undermined and that actions cannot be criticized • it is advisable to refuse to enter a home if: ○ aggressive pets /threatening your safety ○ young children or minors will be alone on the premises at any time without adult supervision - ensure an adult is present at all times ○ customer is under the influence of alcohol ○ customer maybe abusive or unreasonable ○ the customer will not be on the premises at all times ○ if customer will not be there, ensure someone representing the customer's interests is there e.g. neighbour, friend, or relative

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OIL BURNER TECHNICIAN 3 CURRICULUM

Module Title: Customer Relations **Prerequisite(s)**: None **Estimated Practical Hours**: 2

Performance objective: Respond to irate customers and demonstrating sensitivity to cultural differences

Module 15	Practical		
	Scenario	**Procedure**	**Criteria**
15.07.01	This test will determine the student's ability to relate effectively with customers. The student must show knowledge of techniques for preventing damage to customer property and the ability to use strategies to deal professionally with customer inquiries, complaints, and cultural differences. The student will be provided with a role-play scenario: A customer from a culture different from the student's own is irate over what he or she has interpreted as an inappropriate invasion of the home. The student is accused of arriving at an inappropriate time, making a mess of the customer's home, and of only partially solving the mechanical problem his or her company was called to fix. The student must respond in a calm and professional way to the irate customer, played by the instructor or another student.	The student will be given written materials outlining the work order he or she was to complete at the customer's home, the time of the repair/installation visit, and a brief explanation of the complaint the customer is about to make. The person playing the role of the irate customer will also be given written instructions, detailing his or her cultural background, the nature of the complaint, and some suggestions for comments to make about the student's work. The student will practice listening and clarifying, offer a solution, and resolve the customer's complaint in a manner consistent with trade and company policy and practices. An observer will take notes and provide a debriefing when the role play is completed, identifying the student's appropriate and inappropriate use of communication strategies.	The student will have demonstrated the ability to: • listen attentively without interrupting or becoming angry and argumentative • explain his or her work in terms appropriate for the lay person • show sensitivity to cultural differences • determine what solution is appropriate for the problem identified by the customer • ensure that customer has understood explanations by summarizing, paraphrasing and questioning • reach agreement with customer on proposed solution • in appropriate circumstances refer customer to supervisors • throughout the role play, use appropriate language • throughout the role play, use appropriate non-verbal communication patterns • represent his or her company in a positive manner The student will have demonstrated an understanding of: • techniques for preventing property damage and showing respect for a customer's private property • the scope of work appropriate for the oil burner technician level identified in the role play