# NOVA SCOTIA
# APPRENTICESHIP CURRICULUM STANDARD

*for the Occupation of*

# Oil Heat System Technician

September 2013

See Page 1 for NS Program Structure

Revised: January 2008
Version # 1.1
Based on the Atlantic Curriculum Standard

## Preface

This Apprenticeship Training Standard is based on the National Occupational Analysis for the Oil Heat System Technician trade. It was developed through the cooperative efforts of the Atlantic Apprenticeship Council, which consists of both the Atlantic Directors of Apprenticeship and Apprenticeship Board Chairs. This document describes the curriculum content for the Oil Heat System Technician apprenticeship training program and outlines each of the technical training courses necessary for completion of apprenticeship.

## Acknowledgement

Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this Apprenticeship Training Standard. Without their dedication to quality apprenticeship training, this document could not have been produced. A sincere thank you.

This Apprenticeship Training Standard was approved by the Atlantic Apprenticeship Council September 2001.

## Table of Contents

## Program Structure - Nova Scotia Apprenticeship Program

The courses listed below are required technical training in the Nova Scotia Oil Heat System Technician Apprenticeship Program.

| Nova Scotia Course No. | Nova Scotia Course Name | Nova Scotia Prerequisites | Atlantic Curriculum Content To Be Covered | |
|---|---|---|---|---|
| | | | Atlantic Courses | Page No. |
| **Group A** | | | | |
| | Integrated Milestone | | MENT-1801 Workplace Mentoring I (*NS Specific*) | 60 |
| OBMA-0801 | Fundamental Skills | None | OBM-0100 Print Reading & Sketching | 4 |
| | | | OBMA-1001 Safety and Fire Protection*(NS Specific)* | 57 |
| OBMA-0802 | Tools & Equipment / Soldering, Flaring & Threading | None | OBM-0105 Tools & Equipment | 6 |
| | | | OBM-1100 Soldering, Flaring & Threading Pipe | 12 |
| OBMA-1815 | Fuel Storage | OBMA-0801, 0802 | OBM-1105 Fuel Storage Tanks | 14 |
| OBMA-1816 | Fuel Delivery Systems | OBMA-0801, 0802 | OBM-1110 Fuel Delivery Systems | 17 |
| OBMA-1817 | Planned Maintenance / Trade Practice | OBMA-1816 | OBM-0115 Trade Practice | 10 |
| | | | OBM-1195 Planned Maintenance | 54 |
| OBMA-1804 | Combustion & Air Handling | OBMA-1816 | OBM-1115 Combustion & Burner Air Handling Devices | 20 |
| **Group B** | | | | |
| OBMA-1805 | Electricity 1 (Principles of Electricity) | OBMA-0802 | OBM-1120 Electricity 1 (Principles of Electricity) | 23 |
| OBMA-1806 | Electricity 2 (Ignition Systems, Electrical Devices & Switches) | OBMA-1805 | OBM-1125 Electricity 2 (Electrical Devices & Ignition Systems) | 26 |
| OBMA-1818 | Electricity 3 (Electronics & Solid State) / Motors | OBMA-1806 | OBM-1130 Electricity 3 (Solid State & Programmable Controls) | 29 |
| | | | OBM-1140 Motors | 33 |
| OBMA-1807 | Controls & Wiring | OBMA-1806 | OBM-1135 Controls & Wiring | 31 |
| OBMA-1809 | Combustion Chambers / Chimneys, Venting & Draft Control | OBMA-1804, 1817 | OBM-1145 Combustion Chambers | 35 |
| | | | OBM-1150 Chimneys, Venting & Draft Contol | 37 |

| Nova Scotia Course No. | Nova Scotia Course Name | Nova Scotia Prerequisites | Atlantic Curriculum Content To Be Covered | |
|---|---|---|---|---|
| | | | Atlantic Courses | Page No. |
| **Group C** | | | | |
| | Integrated Milestone | | MENT-1802 Workplace Mentoring II (*NS Specific*) | 61 |
| OBMA-1810 | Hydronic Heating Systems | OBMA-1807, 1809, 1818 | OBM-1155 Hydronic Heating Systems | 39 |
| OBMA-1811 | Warm Air Furnaces / Steam Systems | OBMA-1807, 1809, 1818 | OBM-1160 Warm Air Furnaces | 41 |
| | | | OBM-1165 Low Pressure Steam Systems | 43 |
| OBMA-1812 | Domestic Hot Water Heaters / Zoning | OBMA-1807, 1809, 1818 | OBM-1170 Domestic Hot Water Heaters | 45 |
| | | | OBM-1180 Zoning 1 (Hot Water System) | 49 |
| | | | OBM-1200 Zoning 2 (Warm Air System) | 56 |
| OBMA-1819 | House as a System / Retrofit | OBMA-1810, 1811, 1812, 1817 | OBM-1185 Retrofit Systems | 50 |
| | | | OBM-0110 House as a System | 8 |
| OBMA-1808 | Specialized Systems / Service & Troubleshooting | OBMA-1804, 1810, 1811, 1812, 1815, 1817 | OBM-1190 Service & Troubleshooting | 52 |
| | | | OBM-1175 Specialized Systems | 47 |
| OBMA-1820 | Program Review | Entire Program | OBMA-1820 Program Review (*NS Specific*) | 59 |
| **Nova Scotia Oil Heat System Technician Apprenticeship Program: All Courses are Required** | | | | |

## OBM-0100 Print Reading and Sketching

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 2, 3, 4, 5 and 7.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of blueprints and drawings.
- demonstrate knowledge of single line sketches.

**Theory:**

1. Identify drawing instruments, describe their purpose and use.
   - traditional
   - CAD

2. Describe types of drawings and prints and their use.

3. Describe scales, their purpose and use.

4. Identify types of lines and describe their use.
   - object
   - broken
   - extension
   - dimension
   - centre
   - leader
   - break line
   - cutting plane

5. Identify drawing symbols and abbreviations and describe their use.

6. Identify views and describe their use.

7. Identify standard elevations and describe their use.

8. Identify specifications and describe their use.

9. Demonstrate how to perform heat loss calculations.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Identify relevant symbols and lines.

2. Sketch projects to scale.

## OBM-0105 Tools and Equipment

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 1, 2, 3, 4 and 5.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- demonstrate knowledge of safety practices in the use and care of tools and equipment.
- demonstrate knowledge in the selection, operation and maintenance of hand and power tools, equipment and facilities, without damage to equipment, operator or to others.
- demonstrate understanding of the responsibilities of the Oil Heat System Technician toward the employer for the care and proper use of tools.

**Theory:**

HAND AND POWER TOOLS

1. Describe the purpose, applications, procedures for use and care of hand tools.
   - hammers
   - screwdrivers
   - wrenches
   - pliers and wire cutters
   - rulers and measuring tools
   - cutting tools
   - files
   - torque wrenches

2. Describe the purpose, applications, procedures for use and care of power tools.
   - drills and drill bits
   - saws
   - sanders and grinders
   - powder actuated tools

3. Describe the components, applications and procedure for using compressed air systems.

4. Describe powder actuated tools, their applications and procedures for safe use.

SPECIALTY TOOLS

5. Describe the various special tools used in the Oil Heat System Technician trade, their purpose, applications and procedures for use.
   - pressure and vacuum gauges
   - multimeter
   - nozzle wrench
   - flame mirror
   - electrode gauges
   - fan-wheel puller

6. Describe scribers and markers, their purpose, applications and procedure for use.

7. Describe flaring tools, their purpose, applications and procedures for use.

8. Describe grinding tools, their purpose, applications and procedures for use.

9. Describe taps and dies, their purpose, applications and procedures for use.

10. Describe the types of fasteners, their applications and procedures for use.

11. Describe soldering tools, their applications, care and procedures for use.

12. Describe measuring tools, their applications, care and procedures for use.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Complete projects as assigned by instructor.
   - measuring
   - cutting
   - threading
   - filing

## OBM-0110 House as a System

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis task 14.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of building science as it relates to climate control systems.
- demonstrate knowledge of climate control systems.

**Theory:**

COMBUSTION AIR / VENTILATION AIR

1. Define combustion/ventilation and describe its relationship to oil heating systems.

2. Define make up air and describe its relationship to oil heating systems.

3. Calculate the amount of combustion air required for a particular system.

4. Interpret the CSA codes regarding air supply.

HUMIDITY CONTROL

5. Describe the factors affecting humidity.

6. Describe relative humidity and the importance of correct relative humidity.

7. Describe the different types of humidifiers and how they operate.

8. Describe the procedures used to install and service humidifiers.

9. Explain the importance of air change and its effects on humidity.

10. Explain the causes and effects of depressurization by exhaust appliances

BUILDING SCIENCE AND VAPOUR BARRIERS

1. Describe exterior wind barriers, their purpose and operation.

2. Describe vapour barriers, their purpose and operation.

3. Describe the various types of housing insulation, its characteristics and effect on heating requirements.

4. Identify and interpret problems related to oil heating equipment created by changes to a building structure.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Install combustion air vents.

2. Install make up air venting system.

3. Measure humidity.

## OBM-0115 Trade Practice

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis throughout the document.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of the scope and limitations of the trade.
- demonstrate knowledge of professional standards of customer service.
- identify and demonstrate understanding of appropriate codes and regulations.

**Theory:**

RESPONSIBILITIES AND TRADE PRACTICE

1. Describe the responsibilities of the Oil Heat System Technician under the various applicable codes and regulations.
   - workers compensation
   - Occupational Health & Safety Act
   - WHIMS
   - environmental regulations
   - environmental considerations
   - regulations governing fuel tanks
   - fire regulations
   - company regulations
   - plumbing codes
   - electrical codes
   - pressure vessels act
   - installation code for oil burning equipment

2. Describe the responsibilities of the Oil Heat System Technician and workmanship required in the installation code for oil burning equipment.

3. Describe the limitations of work carried out in the Oil Heat System Technician trade and good practices when dealing with other related trade groups.

CUSTOMER SERVICE

4. Describe the relationship between sales and service.

5. Describe good practices for projecting a professional attitude.

- respect the customer
- appearance
- workplace behaviour

6. Describe effective communication.
   - first contact
   - sharing information

7. Describe methods of preventing property damage.
   - vehicles
   - cleanliness
   - use of tools and equipment
   - handling and installation of appliances
   - clean up

8. Describe good practices for dealing with customers.
   - calming customers
   - preventing problems
   - dealing with complaints
   - resolving problems

9. Describe effective strategies for dealing with difficult customers and high risk situations.

10. Describe cultural differences affecting work issues and communication and strategies for overcoming them.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Classroom exercises as determined by the instructor.

## OBM-1100 Soldering, Flaring and Threading Pipe

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis 1, 2, 3, 7, 8 and 9.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of the equipment and procedures used to flare and join copper tubing.
- demonstrate knowledge of the equipment and procedures used to solder fittings.
- demonstrate knowledge of the applications, tools and procedures used for threading pipe.

**Theory:**

1. Describe the uses and applications of brazing and soldering processes.

2. Describe the tools used in brazing and soldering processes, their applications and care.

3. Describe the types of flux, their characteristics and applications.

4. Describe the safety precautions to be observed during brazing and soldering operations.

5. Describe the procedures used to perform brazing and soldering operations on copper tubing.

6. Describe types of pipe threading compounds, and cutting fluids.

7. Describe pipe threading devices, their purpose, applications and procedures for use.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Flare and join copper tubing.

2. Solder fittings.

3. Thread pipe.

## OBM-1105 Fuel Storage Tanks

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 7 and 8.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of fuel storage and supply systems to oil burning equipment.
- demonstrate knowledge of oil tank installation.
- identify and demonstrate understanding of appropriate codes and regulations.

**Theory:**

SELECTION AND LOCATION

1. Describe the characteristics and specifications of tanks.
   - inside
   - above ground
   - underground

2. Describe conditions for locating and placing an oil tank, both steel and non-metallic.
   - inside
   - above ground
   - underground

3. Describe the effects of condensation and methods for remedy and prevention.

4. Describe and interpret the system for pipe sizing.

5. Describe the type and sizing of pipe used in tank installation and the applications of each.

6. Identify and interpret codes and regulations that apply to piping in the trade.

7. Identify and interpret the Regulations for Underground Tanks.

8. Identify and interpret installation codes that apply to metallic and non-metallic storage tanks.
   - CSA
   - U.C.
   - ORD requirements

INSTALLATION

9. Describe safe practices for handling fuels.

10. Describe methods for installing fill and venting pipes.

11. Describe the procedures used to thread pipe.

12. Describe the procedures used to anneal pipe.

13. Describe the procedures used to flare pipe.

14. Describe the methods for installing tubing.
    - cutting and joining
    - fittings
    - clamping and supporting
    - methods of channeling in floors

15. Describe the type, location and placement of tank ancillaries and procedures for installation.
    - gauging devices
    - vent alarm

16. Describe the purpose, types and location of shut-off valves.

17. Describe the procedure for flushing fuel delivery systems.

18. Describe the oil filter assembly and procedures used for installation of oil filter assembly.

19. Describe the procedure for performing visual inspection of fuel storage tanks and installations.

20. Describe the procedures used to cut, thread and install black iron pipe.

21. Demonstrate how to perform calculations of piping material requirements for a given installation.

22. Demonstrate how to perform calculations of tank size.

23. Describe procedure to compile materials list.

24. Describe the procedures used to test oil tanks.
    - pre-installation
    - post installation

25. Describe regulations and procedures for dealing with fuel oil spillages and containment.
    - secondary containment
    - double wall requirements

26. Describe procedures for removal and disposal of oil tanks.
    - regulations
    - safety

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Cut, thread and install black iron pipe.

2. Perform calculations of piping material requirements for a given installation.

3. Perform calculations of tank size.

4. Compile materials list.

## OBM-1110 Fuel Delivery Systems

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13 and 14.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of fuel units, their installation and adjustment.
- demonstrate knowledge of fuel pumps, auxiliary fuel pumps and their installation.
- demonstrate knowledge of nozzles and fuel filters, their applications and installation.

**Theory:**

FUEL UNITS

1. Identify and describe the types of fuel units and their purpose.

2. Identify and describe the component parts of the fuel unit.

3. Describe the characteristics and applications of fuel systems.
   - one pipe
   - two pipe single stage
   - two-stage fuel units
   - auxiliary pumping systems

4. Describe installation procedures for fuel units.
   - pump selection
   - proper rotation
   - alignment
   - sizing of fuel lines
   - pump couplings

5. Describe installation procedures for auxiliary pumps.
   - pump selection
   - proper rotation
   - alignment
   - sizing of fuel lines
   - pump couplings

6. Describe servicing procedures for fuel units.
   - primary venting and bleeding
   - cleaning and replacement of pump screen
   - pressure regulation
   - pressure and vacuum
   - gasket replacement
   - gear replacement
   - regulator replacement
   - seal replacement

7. Describe servicing procedures for auxiliary pumps.
   - primary venting and bleeding
   - cleaning and replacement of pump screen
   - pressure regulation
   - pressure and vacuum
   - gasket replacement
   - gear replacement
   - regulator replacement
   - seal replacement

8. Describe the types of couplings and their applications.

9. Describe procedures used in testing and inspecting fuel units.

10. Describe procedures used in testing and inspecting auxiliary pumps.

11. Describe possible fuel unit problems, their indicators and remedial action to be taken.

12. Describe possible auxiliary pump problems, their indicators and remedial action to be taken.

13. Identify and interpret the appropriate installation codes.

NOZZLES AND FUEL FILTERS

14. Describe the purpose and function of nozzles.

15. Describe the different types of nozzles and nozzle adaptors and their applications.

16. Describe the effect on nozzles of:
   - pressures
   - gravity
   - viscosity

17. Describe the procedures for installation and servicing of nozzles.

18. Describe the procedures for testing nozzles.

19. Describe the purpose and application of oil filters and the procedures for installation and replacement of oil filters.

20. Describe possible problems encountered in working with nozzles and oil filters and their likely causes and appropriate remedies.

21. Describe the care and maintenance of the test equipment and instruments.

22. Describe the diagnostic procedures to be used with test readings.
    - check burner shutdown
    - observe flame
    - look for air leaks
    - check burner operating period

23. Describe the common problems indicated by test readings.

24. Describe the procedure for estimating fuel savings.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Install fuel units.

2. Perform testing procedures on fuel units.

3. Install auxiliary units.

4. Perform testing on auxiliary units.

5. Dismantle and reassemble fuel units.

6. Dismantle and reassemble auxiliary units.

## OBM-1115 Combustion and Burner Air Handling Devices

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12 and 13.

**Course Outcomes:**

Upon successful completion of the course, the apprentice will be able to:
- demonstrate understanding of oil as a fuel.
- demonstrate knowledge of the combustion process.
- demonstrate knowledge of selection, maintenance, and use of appropriate test equipment.
- identify and demonstrate understanding of appropriate codes and regulations.

**Theory:**

FUEL OIL PROPERTIES

1. Describe the composition and origin of heating oil.

2. Describe the refining processes and their products.

3. Describe the types of fuel oils and their applications.

4. Describe the characteristics of fuel oil and their relevance to burning characteristics.
   - flash point
   - pour point
   - water and sediment
   - volatility
   - viscosity
   - gravity
   - sulfur content
   - color

5. Describe the safe handling and storage of fuel oil.
   - storage temperature
   - cross-contamination with other fuels

6. Describe the effects of water and sediment in fuel tanks.

7. Describe the significance of regional variations of fuel properties.

COMBUSTION

1. Describe the relevance of combustion theory to the trade.

2. Define combustion, explain the process and its products.

3. Describe the composition of air and its role in the combustion process.

4. Describe the physical requirements for oil burning.

5. Describe fuel/air ratios and their importance.

6. Describe the process of atomization and its role in the burning of fuel oil.

7. Describe incomplete combustion, its causes and dangers.

8. Describe the relationship between excess combustion air, smoke, and efficiency.

AIR HANDLING PARTS

16. Describe burner fans, their purpose, parts, and operation.

17. Describe turbulators, their purpose, parts, and operation.

18. Describe the types of blowers, their characteristics and applications.

19. Describe spinners, their purpose, parts, and operation.

20. Describe end cones, their purpose, parts, and operation.

21. Describe the types of combustion heads, their purpose, parts, and operation:
    - retention head
    - non-retention head

22. Explain the relationship of adjustment of the various air handling parts to the combustion of the fuel oil.

23. Explain the effects of draft on air delivery.

COMBUSTION EFFICIENCY TESTING

24. Describe the purpose of combustion testing and the main measurements included in combustion testing:
    - combustion air
    - smoke measurement and reduction
    - flue gas/net stack temperature
    - draft measurement

25. Describe the benefits of performing accurate testing interpretation and documentation:
    - to efficiency
    - to the customer

- to the mechanic

26. Describe the draft gauge, its purpose and operation, adjustment and use.

27. Describe the common causes of poor draft.

28. Describe the smoke tester, its purpose, operating principles and procedures for adjustment and use.

29. Describe the test indications and their significance.

30. Describe the CO. analyzer, its purpose, parts, operating principles and procedures for adjustment and use.

31. Describe the dial type stack thermometer and procedures for its use.
    - drilling holes
    - stable stack temperature

32. Describe various types of diagnostic combustion test equipment, its design and advantages.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Perform complete combustion efficiency testing on various heating units.

## OBM-1120 Electricity 1 (Principles of Electricity)

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 1, 3, 4, 5, 8, 9, 10, 11 and 15.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of basic electrical theory, systems and components.
- demonstrate knowledge of selection and use of appropriate electrical test equipment.

**Theory:**

INTRODUCTION TO ELECTRICITY

1. Explain the electron theory.

2. Explain electrical terminology and units of measurement.

3. Describe what is meant by resistance and the factors affecting it.

4. Describe the characteristics of conductors and insulators and their applications.

5. Explain Ohm's Law and use of associated formulae.

DIRECT AND ALTERNATING CURRENT

6. Describe electromagnetism and how it can be used to produce voltage.

7. Describe direct current and how it is created.

8. Describe the trade related applications of direct current.

9. Describe alternating current and how it is created.

10. Describe terms associated with alternating current.
    - cycle
    - hertz
    - effective value
    - electrical characteristics

11. Describe the characteristics of sine waves and their interpretation.

12. Describe the applications within the trade of alternating current.

13. Describe the method of distribution of electric power.

14. Describe the layout of a typical home distribution panel and its relationship to the heating system.

ELECTRICAL CIRCUITS

1. Describe electrical circuits, their components and operation.

2. Describe the procedure used to construct series circuits.

3. Describe the procedure used to construct parallel circuits.

4. Describe the procedures used to construct series/parallel circuits.

5. Describe the causes of excessive current.

6. Describe overload protection circuits.

7. Interpret the abbreviations, formula symbols and circuit symbols found in circuit diagrams.

8. Identify the sections of the Canadian Electrical Code that apply to oil burner installation and service.

9. Describe the procedures used to perform the procedures used to wire a heating system.

ELECTRICAL TEST METERS

1. Describe the Ohmmeter, its purpose and procedures for use.

2. Describe the ammeter/amperage meter, its purpose and procedures for use.

3. Describe the procedure used to test basic wiring components and circuits.
   - fuses
   - terminals
   - circuit breakers
   - resistors
   - switches

4. Describe equipment used to measure.
   - voltage
   - current
   - resistance

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Perform calculations using Ohm's law and associated formulae.

2. Select and use test meters to identify problems in electrical circuits.

3. Construct parallel series circuit.

## OBM-1125 Electricity 2 (Electrical Devices and Ignition Systems)

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 1, 2, 3, 4, 5, 8, 9, 10, 11, 12 and 13.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of electrical devices and their operation.
- demonstrate knowledge of the installation, diagnosis, repair and replacement of ignition systems.

**Theory:**

ELECTRICAL DEVICES

1. Describe electromagnetic (solenoid) valves and their function.

2. Describe the purpose, layout and operation of relays.

3. Describe the procedures for installation of relays.

4. Describe the purpose, operation and location of transformers.

5. Describe the potential problems, diagnostic procedures and servicing of relays.

6. Describe resistors and circuit breakers, their layout, purpose and operation.

7. Describe timing devices, their purpose and two most common methods of operation.

8. Describe the operating principles of electric motors.

SWITCHES

1. Describe electrical switches, their operating principles and their purpose.

2. Describe the types of switches, their operation and applications.
   - micro (snap-acting)
   - mercury switches

3. Explain switch terminology.
   - SPST
   - SPDT
   - DPST
   - DPDT
   - direct
   - reverse acting

4. Describe the trade applications of the various types of switches.
   - main switch
   - burner control
   - limit control
   - timers
   - thermostats
   - relays

5. Describe the location of switches.

6. Describe potential problems with switches, their causes and corrective action.

TRANSFORMERS AND SOLID STATE IGNITIONS

1. Describe the purpose and operation of the ignition system.

2. Describe the purpose and parts of the A-C transformer.

3. Describe primary and secondary voltage and their relationship.

4. Describe the relationship between voltage and amperage and the dangers presented through handling transformers as a result.

5. Describe the factors to be taken into account when selecting transformers and the significance of each.

6. Describe the procedures used to wire an ignition transformer into the circuit:
   - interrupted ignition
   - intermittent ignition

7. Describe the characteristics of the solid state electronic ignition.

ELECTRODES AND INSULATORS

1. Describe insulators, their characteristics and function.

2. Describe the methods of providing an efficient path to the ignition electrodes.
   - ignition cable
   - buss bars
   - spring clips

3. Describe ignition electrodes, their purpose, components and function.
   - rods
   - holders

4. Describe set up procedures for electrode adjustment.

IGNITION PROBLEMS AND CAUSES

1. Describe the procedures and equipment used to test transformers.

2. Describe problems caused by improper electrode adjustment.

3. Describe the equipment and procedures used to test and set electrodes.

4. Describe common procedures used to service ignition equipment.

5. Describe common ignition failure problems, their cause and solutions.

6. Describe the types and purpose of ignition control systems.
   - intermittent ignition
   - interrupted ignition

7. Describe the symptoms of defective ignition and their causes.

8. Describe the procedures used to perform inspection and testing of ignition systems.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Construct a variety of electrical system circuits using electrical devices as specified by the instructor.

2. Perform the procedures used to test a transformer.

3. Adjust and set electrodes according to manufacturer's specifications.

4. Inspect and test ignition systems.

## OBM-1130 Electricity 3 (Solid State and Programmable Controls)

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13 and 15.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of basic electronic theory, systems and components.
- demonstrate knowledge of programming controls.
- demonstrate knowledge of troubleshooting problems with electronic and solid state components.

**Theory:**

1. Describe the theory of operation of electronics solid state and programmable controls.

2. Describe components of an electronic system.
   - capacitor
   - resistance
   - diode
   - symbol
   - xener
   - transistor
   - triac
   - laser

3. Describe the principles of operation of relay circuits.

4. Describe procedures used to program controls.
   - outdoor reset controls
   - prioritizing functions

5. Identify oil burning equipment components where electronic controls are used.

6. Troubleshoot problems with electronic devices, and solid state components.

7. Describe procedures used to troubleshoot electronic circuits.
   - locate the defective components
   - test methods
   - interpretation of test results
   - corrective action

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Program a control.

2. Construct electronic circuits using electronics and solid state components.

## OBM-1135 Controls and Wiring

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 2, 3, 4, 5, 7, 8, 9, 10, 11, 12 and 13.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of the procedures used to install, service and maintain limit controls and thermostats.
- demonstrate knowledge of the procedures used to install, service and maintain limit primary controls.

**Theory:**

LIMIT CONTROLS AND THERMOSTATS

1. Describe the different types of limit controls, their purpose and operation.
   - hot water
   - steam
   - warm air

2. Describe the location and installation procedures for limit controls.

3. Describe the setting and adjustment of limit controls for various requirements.

4. Describe the potential problems, checks, diagnostic procedures and servicing for limit controls.

5. Identify sources of information for installation of limit controls and describe their importance and use.
   - code
   - manufacturers' instructions

6. Describe the types of thermostats, their function and applications.

7. Describe factors affecting location of limit controls.
   - thermostat
   - humidity control
   - air stat
   - aquastat
   - pressure control

8. Describe the procedures for installation of limit controls.

- thermostat
- humidity control
- air stat
- aquastat
- pressure control

9. Describe the potential problems, diagnostic procedures and servicing of thermostats.

PRIMARY CONTROLS

1. Describe the different types of primary controls used in the oil heat industry and their purpose.

2. Describe stack mounted primary controls, their layout, function and applications.

3. Describe Cad Cell primary controls, their layout, operation and applications.

4. Describe how to locate and wire controls to perform a specific function.

5. Explain procedures for testing controls for proper operation.

6. Describe troubleshooting procedures used to locate problems with controls.

7. Describe possible control problems, their cause and procedures for correction.

8. Read and interpret schematic and pictorial diagrams.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Install heating system controls for various types of systems.

2. Wire a heating system.

## OBM-1140Motors

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 5, 8, 9, 10, 12 and 13.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- demonstrate knowledge of the operation, installation and repair of motors, fans and couplings.

**Theory:**

1. Describe the types of motors found on heating systems and their characteristics.

2. Describe motor terminology.

3. List the major characteristics of a split phase centrifugal switch motor.

4. Describe the components and operation of a split phase centrifugal switch motor.
   - start switch
   - overload switch
   - internal wiring
   - connections
   - capacitors

5. Describe the purpose of bearings, the various types of bearings and their applications.

6. Describe diagnostic and inspection procedures for motors and remedial action to be taken.
   - malfunction
   - motor replacement
   - inspection

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Disassemble an electric motor, carry out minor repairs and reassemble motor.

2. Perform various tests on motors.

## OBM-1145 Combustion Chambers

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 2, 3, 4 and 5.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of the construction and operation of a combustion chamber.

**Theory:**

1. Identify hazardous materials and practices for safe handling.

1. Describe the types of materials used in the manufacture of combustion chambers and their characteristics.
   - common fire brick
   - insulating fire brick
   - metal
   - ceramic
   - soft fibre materials-wet and dry

2. Describe the types of insulation used and their applications.

3. Describe the characteristics of size and shape of the combustion chamber and their relationship to efficient combustion.

4. Describe the procedure for installation of combustion chambers.

5. Describe the procedures used to clean and repair combustion chambers.

6. Describe the procedures used for replacement of combustion chambers.

7. Describe chamberless firing.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Design and construct combustion chambers to instructor's specifications.

## OBM-1150 Chimneys, Venting and Draft Control

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 2, 3, 4, 5, 8, 12 and 13.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- evaluate and plan the draft and venting requirements of systems.
- demonstrate knowledge of venting systems and their installation.

**Theory:**

CHIMNEYS

1. Describe the purpose of draft and how draft is created.
   - natural
   - mechanical
   - induced

2. Describe the conditions needed to maintain adequate chimney draft.
   - location
   - chimney size
   - temperature

3. Describe potential chimney problems affecting draft, their symptoms and their solutions.

4. Describe how chimney draft is measured.

VENTING AND DRAFT CONTROL

5. Describe the effects of improper draft.
   - air leakage
   - standby losses
   - burner air delivery
   - spillage

6. Describe the purpose and function of draft regulators.

7. Describe direct venting, draft inducers and power venting, and explain operation and applications.

8. Describe the operation of a sealed combustion direct vent system.

9. Identify and interpret the CSA codes relating to venting.

10. Describe the necessity of stainless steel chimney liners and sizing procedures.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Install smoke pipes.

2. Install a prefabricated chimney.

3. Inspect chimneys and perform draft adjustment.

4. Install mechanical venting systems.
   - sidewall
   - direct

## OBM-1155 Hydronic Heating Systems

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 2, 3 and 13.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of hydronic heating systems and their characteristics.
- demonstrate knowledge of installation and maintenance procedures related to hot water boilers.

**Theory:**

HYDRONIC HEATING SYSTEMS

1. Describe the typical components of hot water boilers, their purpose and operation.
   - combustion chamber
   - heating surfaces
   - baffles or turbulators
   - insulation

2. Describe the system for rating boilers.
   - net ratings
   - gross ratings

3. Describe the operation of a gravity type open system.

4. Describe the operation of a forced circulation closed system.
   - two-pipe system
   - reverse return system
   - in-floor radiant systems

5. Explain the purpose and function and applications of the controls and other devices used in the operation of a hot water boiler.
   - circulator
   - pressure reducing valve
   - flow control valve
   - air elimination valves
   - expansion tanks
   - zone control
   - tempering valves
   - coils (tankless, indirect water heater)
   - couplings

- pressure relief valves
- tridicator valve
- wood/oil combination

6. Explain the operation and application of a wood/oil add-on hot water boiler.

7. Describe the different piping systems used for heat delivery and their applications.

8. Describe the different types of radiation.

9. Describe routine maintenance procedures for hot water heating systems.

10. Describe methods of backflow prevention.

11. Describe potential boiler problems, diagnostic procedures and solutions.

12. Describe how to layout a hydronic heating system.

13. Describe the benefits of pipe insulation.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Plumb and hook up a hydronic heating system.

2. Layout a hydronic heating system.

3. Compile a materials take off list.

4. Sketch a hydronic heating system.

## OBM-1160 Warm Air Furnaces

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 4, 5 and 12.

**Course Outcomes**:

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of warm air heating systems and their installation.
- demonstrate knowledge of troubleshooting and servicing procedures for warm air heating systems.
- demonstrate knowledge of the installation and servicing of humidifiers and electrostatic air cleaners.

**Theory:**

SYSTEM COMPONENTS AND OPERATION

1. Describe the components and operation of a warm air system.
   - gravity
   - forced

2. Explain the purpose and function of controls and other devices used in the operation of a warm air system.
   - oil
   - wood/oil combination
   - wood add-on

3. Describe the parts of warm air distribution systems and their applications.
   - oil
   - wood/oil combination
   - wood add-on

4. Describe the procedures used to test, adjust and balance air flow systems.
   - static pressure
   - temperature rise

INSTALLATION

5. Explain the basic procedures for design and installation of a warm air system.
   - duct sizing
   - heat loss
   - size and type of furnace
   - CFM air flow

- system requirements
- code requirements
- manufacturer specifications
- diffusers and registers

6. Describe humidifiers, their parts, operation and procedures for installation.

7. Describe electrostatic air cleaners, their parts, operation and procedures for installation.

SERVICE AND MAINTENANCE

8. Describe routine maintenance procedures for warm air heating systems.

9. Describe the potential problems in warm air systems, diagnostic procedures and remedies.

10. Describe procedures used to test heat exchangers for leakage

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Install plenums and sheet metal ductwork.

2. Design a warm air system.

3. Compile a materials list.

4. Measure and adjust air flow.

## OBM-1165 Low Pressure Steam Systems

**NOA Reference**:

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 2, 3 and 13.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of steam heating systems and their components.
- demonstrate knowledge of installation, servicing and maintenance of steam heating systems.

**Theory:**

SYSTEM COMPONENTS AND OPERATION

1. Describe methods of heat transfer.
   - latent
   - radiant
   - conductive
   - convective

2. Describe the principles of steam heating.

3. Describe one pipe systems, their layout and operation.

4. Describe two pipe systems, their layout and operation.

5. Describe the operation, function and proper location of the controls required.

6. Describe the function of steam traps.

7. Describe pumps, receivers and Hartford hoop.

INSTALLATION

8. Describe procedures used to remove and replace system components.

9. Describe the importance of piping specifications and the general instructions given by manufacturers.

10. Explain how to skim a new boiler to remove contaminants.

11. Explain how to balance system radiation.

- one pipe systems
- two pipe systems

SERVICE AND MAINTENANCE

12. Describe routine inspection and maintenance procedures for steam heating systems.

13. Describe troubleshooting procedures used to identify problems in steam heating systems and corrective action to be taken.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Wire controls for steam heating systems.

2. Set up and adjust the burner.

3. Perform efficiency testing of the burner.

## OBM-1170 Domestic Hot Water Heaters

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 2 and 3.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of domestic hot water heaters their components and operation.
- demonstrate knowledge of the installation procedures for domestic hot water heaters.

**Theory:**

SYSTEM TYPES AND COMPONENTS

1. Describe the components and operation of indirect fired hot water heaters.

2. Describe the components and operation of direct fired hot water heaters.

3. Explain the purpose and function of controls and other devices used on domestic hot water heaters.
   - relief valves
   - backflow preventers
   - tempering valves
   - dielectric fittings
   - pressure reducing valves
   - anode rod

INSTALLATION

4. Describe the procedures for installation of indirect fired hot water heaters (tankless coil).

5. Describe the procedures for the installation of direct fired hot water heaters.

SERVICE AND MAINTENANCE

6. Describe the procedures for performing routine maintenance of domestic hot water heaters.

7. Describe procedures for identifying problems in hot water heaters and corrective action to be taken.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Install an oil fired water heater.

2. Install an indirect water storage and heater.

## OBM-1175 Specialized Systems

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 1, 3, 4, 5, 8, 9, 10, 11 and 15.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of vaporizing oil burners, their components, operation and installation.
- demonstrate knowledge of waste oil burners, their components and operation.
- demonstrate knowledge of combo systems, their components and operation.

**Theory:**

VAPORIZING OIL BURNERS

1. Identify the types of vaporizing oil burners, and their characteristics and applications.
   - natural draft pot-type
   - forced draft

2. Describe the oil supply system for vaporizing burners.
   - wall lift pump
   - day tank
   - installation

3. Explain how to service, adjust and calibrate a constant level value.

4. Explain installation and service procedures for both natural and forced draft vaporizing burners.
   - code requirements
   - oil flow control valve
   - level seating of the burner

5. Describe the troubling and maintenance and procedures related to vaporizing oil burners.
   - position of flame rings
   - oil flow control valve

WASTE OIL HEATING

6. Describe the types of waste oil heating systems, their principles of operation, characteristics and applications.
   - furnace
   - boiler

7. Describe the various regulations affecting the installation and use of waste oil systems.
   - laws
   - code requirements (fire and environmental)

8. Describe the types of secondary pumps, their functions, components and applications.

9. Describe the procedures used to install waste oil heating systems.
   - manufacturer's instructions
   - assembly
   - venting
   - fuel pipes
   - wiring

10. Describe the procedures used to set up and test the burner.
    - safety set-up
    - operation of burner in relation to system
    - testing

COMBO SYSTEMS

11. Describe combo systems, their components and principles of operation.

12. Describe the procedures used to install a combo-system.

13. Describe the procedures used to perform routine maintenance of a combo-system.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Remove, disassemble, clean, reassemble, calibrate and reinstall the oil flow control valve.

2. Install a natural draft burner.

## OBM-1180 Zoning 1 (Hot Water System)

**NOA Reference**:

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 2, 3 and 11.

**Course Outcomes**:

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of the purpose, design and operation of zoned systems.
- demonstrate knowledge of the installation of zoned systems.

**Theory:**

1. Explain the benefits of zoning and its applications.

2. Describe different types of zone valves and their applications.

3. Describe warm air zone dampers and how they operate.

4. Interpret the wiring schematics for zoning installations.

5. Describe the procedures used to install a 3-zone hot water system.

6. Describe the use of circulators for hot water zoning.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Plan and install a zoned hot water system to specifications.

## OBM-1185 Retrofit Systems

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 14, 15 and 16.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge to plan appropriate climate control systems.
- demonstrate knowledge of the removal and installation of retrofit systems and components.
- demonstrate knowledge of installation procedures of humidifiers.
- identify and apply code requirements for air exchangers and humidifiers.

**Theory:**

SYSTEM EVALUATION AND PLANNING

1. Describe the sources of heat loss and their effects on efficiency.
   - off-cycle
   - on-cycle
   - jacket loss
   - pipe and duct loss

2. Describe the characteristics of flame retention burners and their effect on efficiency.

3. Describe the design characteristics of heating systems that will most benefit by boiler or furnace replacement.

4. Describe draft regulators, the factors that affect their efficient operation, and their contribution to the reduction of heat loss.

5. Describe the logic behind reducing fuel nozzle size and the effect on efficient heating.

6. Describe the possibilities and methods for reducing temperature settings of boilers and furnaces for maximum efficiency.

7. Describe methods of heat loss reduction, their applications and effects on efficiency.
   - insulation and air sealing
   - turbulator (baffle) replacement

8. Describe the advantages of regular system tune ups and the basic steps involved in efficiency tune up.

9. Describe the procedures used to calculate the heating requirements of the customer.

10. Describe the process for obtaining approval for retrofit from the necessary agencies.

SYSTEM REMOVAL AND INSTALLATION

1. Describe the precautions to be taken before removal of an existing appliance or system.

2. Describe the sequence of procedures to be followed when removing an existing oil fired appliance.

3. Describe codes and regulations that apply to the disposal of system components and materials.

4. Describe the sequence of procedures involved in the installation of a retrofit system.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Evaluate an existing heating system and prepare a proposal with recommendations for retrofit and upgrading.

2. Compile a work schedule.

3. Compile a materials list.

4. Perform modernization and upgrade on an existing system.

## OBM-1190 Service and Troubleshooting

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 10 and 13.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of troubleshooting techniques and diagnostic procedures.
- demonstrates knowledge of servicing procedures.
- demonstrate knowledge of selecting of appropriate test equipment.

**Theory:**

NO HEAT

1. Describe the procedure used to identify the point of failure.

2. Describe the system parts associated with each step of the sequence.

3. Describe the possible causes and corrective action for each indication.

UNDERHEATING/OVERHEATING

1. Describe the possible problems associated with oil delivery and courses of corrective action to be taken.

2. Describe the possible problems associated with electrical circuit and courses of corrective action to be taken.

3. Describe the possible problems associated with flame adjustment and courses of corrective action to be taken.

4. Describe the possible problems associated with heating systems and courses of corrective action to be taken.

OPERATIONAL PROBLEMS

1. Describe the possible problems associated with oil delivery and courses of corrective action to be taken.

2. Describe the possible problems associated with electrical circuit and courses of corrective action to be taken.

3. Describe the possible problems associated with flame adjustment and courses of corrective action to be taken.

4. Describe the possible problems associated with venting systems and courses of corrective action to be taken.

5. Describe the possible problems associated with heating systems and courses of corrective action to be taken.

6. Describe the possible problems associated with the mechanical components and courses of corrective action to be taken.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Select and use appropriate test equipment to troubleshoot systems.

## OBM-1195 Planned Maintenance

**NOA Reference:**

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 5, 8, 9, 10, 11, 12 and 13.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of regular maintenance requirements and practices.
- provide a professional standard of customer service.
- identify and demonstrate understanding of appropriate codes and regulations.

**Theory:**

1. Describe the objectives of regular service and maintenance.
   - reduction of service calls
   - efficiency
   - life of equipment
   - customer comfort and satisfaction

2. Describe the advantages of adopting a systematic approach and sequence to service calls.

3. Describe the components serviced during annual maintenance.

4. Describe the inspection and servicing procedures involved in annual maintenance of the various types of heating system.

5. Describe the steps of annual maintenance checks and their associated procedures

6. Describe the procedures used to disassemble and clean components of various types of heating system.

7. Describe the procedures used to reassemble and set up various types of heating system.

8. Describe the factors evaluated to determine system efficiency and the adjustments made to ensure safe and efficient operation of the system.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Disassemble and clean components of various types of heating system.

2. Reassemble and set up various types of heating system.

3. Perform efficiency test and make appropriate adjustments.

## OBM-1200 Zoning 2 (Warm Air System)

**NOA Reference**:

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis tasks 2, 3 and 11.

**Course Outcomes**:

Upon successful completion of this course, the apprentice will be able to:
- demonstrate knowledge of the purpose, design and operation of zoned systems.
- demonstrate knowledge of the installation of zoned systems.

**Theory:**

1. Explain the benefits of zoning and its applications.

2. Describe different types of zone valves and their applications.

3. Describe warm air zone dampers and how they operate.

4. Interpret the wiring schematics for zoning installations.

5. Describe the procedures used to install a 3-zone hot water system.

6. Describe the use of circulators for hot water zoning.

**Practical:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Plan and install a zoned warm air system to specifications.

## OBMA-1001 Safety and Fire Protection

(Nova Scotia Unit of Instruction)

**NOA Reference**:

The material covered satisfies in whole or in part, the requirements of National Occupational Analysis task 1.

**Course Outcomes:**

Upon successful completion of this course, the apprentice will be able to:

- demonstrate knowledge of safety procedures and practices.

**Required Knowledge and Skills:**

1. Describe occupational health and safety rules as outlined in the act and regulations.

2. Describe good housekeeping practices.

3. Describe correct procedures for the reporting of accidents.

4. Identify personal safety equipment and describe the correct procedures for its use and care.
   - safety hats
   - gloves
   - safety shoes
   - safety glasses
   - respirators

5. Describe practices for working safety:
   - with welding equipment
   - near pressurized or high temperature systems
   - in confined spaces

6. Describe the procedures for working safely with ladders and scaffolds.

7. Describe the WHMIS system, its purpose and use.
   - function and use of MSDS sheets
   - personal responsibility

8. Describe the correct use and applications of various types of fire fighting equipment.

9. Describe the dangers presented by electrical hazard.

10. Describe electrical safety procedures.
    - basic safety procedures
    - lock out/tag out
    - in the event of electrical shock

**Suggested Learning Activities:**

Practical skills enhance the apprentice's ability to meet the objectives of this course. The learning objectives outlined below are mandatory in Newfoundland, but are provided as suggestions for Nova Scotia, Prince Edward Island and New Brunswick. Practical activities include:

1. Classroom exercises as determined by the instructor.

## OBMA-1820 Program Review

(Nova Scotia Unit of Instruction)

**Learning Outcomes:**

- Upon successful completion of this unit, the apprentice will complete a study plan based on the National Occupational Analysis.

**Objectives and Content:**

1. Identify areas of the program where knowledge of theory is weakest.

2. Identify areas where workplace experience is lacking or weak.

3. Identify resources necessary to address areas of shortfall.

4. Identify timelines to address areas of weakness.

**Suggested Learning Activities:**

1. Conduct a mock certification exam to be used for diagnostic purposes.
2. Review the National Occupational Analysis.
3. Review the Apprentice Logbook.
4. Review the Exam Preparation information found at www.nsapprenticeship.ca under Quick Links, Exam Preparation.
5. Conduct a final mock certification exam.

**Resources:**

These are the recommended resources to use in the delivery of this unit:

- Exam Preparation information, including videos, occupational analyses, exam counseling sheets, practice exams and sample questions, and other study materials and resources, can be found at www.nsapprenticeship.ca under Quick Links, Exam Preparation.
- Apprentice's personal logbook
- Applicable codes and regulations
- Program texts

**Evaluation:** pass/fail

## MENT-1801 Workplace Mentoring I

(Nova Scotia Unit of Instruction)

**Learning Outcomes:**

- Identify and explain strategies for learning workplace skills.
- Demonstrate strategies to assist in learning skills in the workplace.

**Objectives and Content:**

1. Describe the importance of your own experiences.
2. Identify the partners involved in apprenticeship.
3. Describe the shared responsibilities for workplace learning.
4. Determine your own learning preferences and explain how these relate to learning new skills.
5. Describe the importance of different types of skills in the workplace.
6. Describe the importance of essential skills in the trade.
7. Identify different ways of learning.
8. Identify your learning preferences.
9. Identify different learning needs and strategies to meet learning needs.
10. Identify techniques for effective communication.
11. Identify strategies to assist in learning a skill.

**Resource:**

- Recommended resource to use in the delivery of this unit: www.apprenticeship.nscc.ca/mentoring/apprentice.htm

## MENT-1802 Workplace Mentoring II

(Nova Scotia Unit of Instruction)

**Learning Outcomes:**

- Identify and explain strategies for teaching workplace skills.
- Demonstrate strategies to assist in teaching skills in the workplace

**Objectives and Content:**

1. Describe the impact of your own experiences in teaching skills.
2. Identify the different roles played by a workplace mentor.
3. Describe the six-step approach to teaching skills.
4. Explain the importance of identifying the point of the lesson.
5. Identify how to choose a good time to present a lesson.
6. Explain the importance of linking the lessons.
7. Identify the components of the skill (the context).
8. Describe considerations for demonstrating a skill.
9. Identify types of skill practice.
10. Describe considerations in setting up opportunities for skill practice.
11. Explain the importance of providing feedback.
12. Identify techniques for giving effective feedback.
13. Describe a skill assessment.
14. Identify methods of assessing progress.
15. Explain how to adjust a lesson to different situations.

**Resource:**

- Recommended resource to use in the delivery of this unit: www.apprenticeship.nscc.ca/mentoring/apprentice.htm

## Nova Scotia Document Evaluation Form

Thank you for your interest in the development and revision of this document. Upon review of the document, please record your feedback in relation to the following items:

- course division and organization
- relevancy of the content
- errors or omissions
- other suggestions for improvement and consideration

Overall comments are to be entered on this evaluation form and specific changes are to be entered directly on the document in the relevant area(s). When making proposed corrections(s) in the document, please use red ink. When all feedback has been recorded, return this evaluation form along with the document to the Apprenticeship Office noted at the bottom of the page.

(PLEASE PRINT)
Trade: Oil Heat System Technician
Full Name: _____
Type of Position: (Trade Practitioner, Instructor, etc.): _____
Company: _____
Address: _____
Telephone: _____

Comments: (Use a separate sheet of paper if necessary)

_____
_____
_____
_____
_____

Return Evaluation Form and Document to:

Department of Labour and Advanced Education
Apprenticeship Training division
PO Box 578, 2021 Brunswick St.,
Halifax, NS B3J 2S9