



**Skilled  
Trades**  
Ontario

**Métiers  
spécialisés**  
Ontario

Apprenticeship  
Curriculum Standard

Facilities Mechanic

Level 1 Common Core  
with Facilities Technician 255B  
Includes Level 2 for 255W

255W

2005



# Apprenticeship Pathway to a Certificate of Qualification

Phase 1: Registration

**Submit Application for Apprenticeship Training through the on-line portal or to local Service Delivery Office**

For on-line portal, please follow instructions for registration. You will need to create a *My Ontario* account to access online services.

**Training agreement signed and registered by both apprentice and sponsor**

**Access your Apprenticeship Training Standard Logbook\*\***  
skilledtradesontario.ca/about-trades/trades-information

\*\* This is the official record of your training progress. You are responsible for keeping it up-to-date.

**Complete on-the-job training**

*Demonstrate and receive sign-off on the competencies/skills in your Apprenticeship Training Standard Logbook*

**Complete in-school training**

*Attend and complete the in-class training set out in the Curriculum Training Standard*

Apprentices eligible to apply for apprenticeship incentive grants (Red Seal trades) and loans.

**Review and finalize your logbook with your sponsor**

**Submit proof of apprenticeship completion**  
via email, in-person or digital portal

Your Apprenticeship Training Standard Logbook details completion requirements. Submit the following:

- completed Apprenticeship Training Standard Logbook with signatures
- proof of hours

**Certificate of Apprenticeship is issued**

Trades without examination

**CofA is the final step of the program**

Trades with examination (compulsory and non-compulsory trades)\*

**Provisional Certificate of Qualification issued for a 12 month term**

To prepare for the CofQ examination download the Provincial and/or Red Seal Exam preparation guides.

**Make payment for your Certificate of Qualification examination**

Call to make a payment (647-847-3000 or 1-855-299-0028)

**Schedule a date to write your Examination**

To schedule your examination, contact your local Service Delivery Office.

**Pass Certificate of Qualification examination**

Apprentices eligible to apply for Apprenticeship Completion Grant (Red Seal trades) or Apprentice Completion Bonus (non-Red Seal)

**Certificate of Qualification is issued**

Upon completion, Sponsors may be eligible for Apprenticeship grants, incentives, bonuses or tax credits

Phase 2: Apprenticeship

Phase 3: Certification

\* For a list of trades subject to a certification examination, visit: skilledtradesontario.ca

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**Please Note:** This Standard has been revised to reflect the visual identity of Skilled Trades Ontario (STO) which replaced the Ontario College of Trades on January 1, 2022. The content of this Standard may refer to the former organization; however, all trade specific information or content remains relevant and accurate based on the original date of publishing.

Please refer to STO's website: [skilledtradesontario.ca](https://skilledtradesontario.ca) for the most accurate and up to date information. For information about BOSTA and its regulations, please visit [\*\*Building Opportunities in the Skilled Trades Act, 2021 \(BOSTA\)\*\*](#).

Any updates to this publication are available on-line; to download this document in PDF format, please follow the link: [Skilled Trades Ontario.ca](https://skilledtradesontario.ca).

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*Maintained with transfer to Skilled Trades Ontario 2005 (V100)*

## **Preface**

This curriculum standard for the Facilities Mechanic trade program is based upon the on-the-job performance objectives, located in the industry-approved training standard.

The curriculum is organized into 2 levels of training. The Reportable Subjects Summary chart (located on page 6) summarizes the training hours for each reportable subject.

The curriculum identifies the learning that takes place in-school. The in-school program focuses primarily on the theoretical knowledge and the essential skills required to support the performance objectives of the Apprenticeship Training Standards.

Employers/Sponsors are expected to extend the apprentice's knowledge and skills through practical training on a work site. Regular evaluations of the apprentice's knowledge and skills are conducted throughout training to verify that all apprentices have achieved the learning outcomes identified in the curriculum standard.

It is not the intent of the in-school curriculum to perfect on-the-job skills. The practical portion of the in-school program is used to reinforce theoretical knowledge. Skill training is provided on the job.

Please refer to Skilled Trades Ontario website ([www.skilledtradesontario.ca](http://www.skilledtradesontario.ca)) for the most accurate and up-to-date information about Skilled Trades Ontario. For information on *Building Opportunities in the Skilled Trades Act, 2021 (BOSTA)* and its regulations, please visit [Building Opportunities in the Skilled Trades Act, 2021, S.O. 2021, c. 28 - Bill 288 \(ontario.ca\)](http://www.skilledtradesontario.ca/building-opportunities-in-the-skilled-trades-act-2021-s.o.-2021-c.-28-bill-288)

## **Pre-requisites**

In order to advance to Level 2 of the apprenticeship program, an individual must have completed all of the units outlined in Level 1.

## **Hours Disclaimer (if applicable)**

It is agreed that Training Delivery Agents (TDAs) may need to make slight adjustments (with cause) according to particular apprentice needs and may deviate from the unit sequencing and the prescribed practical and theoretical hours shown within the standard. However, all TDAs will comply with the hours at the reportable subject level.

**Personal and Safety Equipment:** Personal protective equipment is at the discretion of the TDA who must conform to Ontario Provincial Health and Safety Regulations.

## Introduction

This curriculum standard for the Facilities Mechanic trade is developed from the learning outcomes, which were in turn identified from the industry-approved training standard.

The curriculum is organized into two levels of training, each including reportable subjects containing related learning outcomes to reflect the units of the training standard. The hours chart indicates how the curriculum can be delivered in the current block release format and summarizes the hours of training for each reportable by level. Since the reportable subjects are all divisible by three they can be adapted to accommodate a more flexible training delivery other than block release.

The reportable subjects are cross-referenced to the training standard for ease of comparison.

Each reportable subject and learning outcome identifies a recommended number of training hours. This hour allotment is broken into hours for instruction in theory and practical application. The division of the curriculum into reportable subjects that follow a natural progression of learning through the levels and branches of training will allow training centres and apprentices flexibility in program delivery while still observing the importance of sequencing learning in a logical progression.

The curriculum is framed by and includes specific references to terminal performance objectives in the Apprenticeship Training Standards Facilities Mechanic. However, it identifies only the learning that takes place off the job, in a training centre. The in-school program focuses primarily on the theoretical knowledge required to master the performance objectives of the Training Standards. Employers are expected to extend the apprentice's knowledge and skills through appropriate practical training on the work site. Regular evaluations of the apprentice's knowledge and skills is conducted throughout training to assure that all apprentices have achieved the learning outcomes identified in the curriculum standard. The balance between theoretical and practical evaluation is identified for each unit of learning outcomes.

This document is a revision of the May 1999 (printed February 2000) Facilities Maintenance Mechanic Apprenticeship In-School Curriculum Standards. The revisions are based on consultation and collaboration with the Industry Committee, Ministry of Training, Colleges and Universities - Program Development and Standards Unit, Project Steering Committee, Project Team and other industry partners. The continuous advancement of new technology, innovative techniques, and more complex equipment result in increased demands for trades persons who need to be skilled in the practical aspects of the trade, but also need sound theoretical knowledge of the operation, inspection, diagnoses, repair, and service requirements of facilities. Also, the trade name was changed to Facilities Mechanic. The name of the companion trade was changed to Facilities Technician.

In 2001, the Facilities Mechanic and Facilities Technician Apprenticeship programs were reviewed by the Facilities Operations Industry Committee and MTCU Program Co-coordinator, as it was apparent that the learning content of the programs overlapped, contained too much commonality, and content needed to be updated and modified. It was agreed that the Facilities Mechanic and Facilities Technician apprenticeships would be two distinct programs. In the May 1999 versions of the Curriculum Standards for Facilities Maintenance Mechanic and Facilities Systems Technician, Phase 1 and Phase 2 of each program were common. The Facilities Systems Technician program was an extension of the Facilities Maintenance Mechanic program with the addition of Phase 3.

Originally, learning outcomes that would have been more appropriate to the Facilities Technician program had been moved to the Facilities Mechanic program due to constraints in hours. It was decided that this content would be moved back to the Facilities Technician program and additional required curriculum for the Facilities Mechanic program would be added. Both the Facilities Mechanic and Facilities Technician programs now have a common Phase 1 since common core content for both programs is needed.

The changes to the Facilities Mechanic Program are as follows: (Additional content is highlighted as **“new”**)

Implementation date:  
April 2005



### Level 1: Common Core with Facilities Technician

Previous Units*	Hours	Revised Reportable Subjects	Hours
1.2 Health and Safety 1.2 Fire Safety Equipment 1.5 Tools and Equipment	20 10 12	1.1 Safety and Tools	30
1.3 Communications 1 2.8 Communications 2	12 20	1.2 Communications	24
1.4 Trade Calculations	18	1.3 Occupational Calculations	18
1.8 Plumbing 1 2.2 Plumbing 2	18 18	1.4 Plumbing	36
1.15 Custodial & Grounds Maintenance 1.6 Building Maintenance 1 2.1 Building Maintenance 2	18 18 30	1.5 Facilities Maintenance 1	48
1.13 Electrical 1 2.4 Electrical 2	18 30	1.6 Electricity	42
		1.7 Blueprint Practices ( <b>new</b> )	18
2.10 Brazing and Welding	30	1.8 Brazing and Welding	24
		<b>Total</b>	<b>240</b>

\* **Note:** All learning outcomes of previous curricula have been included in the new standards, but have been realigned. Hours listed may not accurately reflect previously assigned hours.

**Level 1: Facilities Mechanic**

<b>Previous Units*</b>	<b>Hours</b>	<b>Revised Reportable Subjects</b>	<b>Hours</b>
1.10 Fume Hoods 1.9 Ventilation Systems 1 2.7 Ventilation Systems 2	12 18 30	2.1 Ventilation Systems	42
1.7 Air Conditioning Systems 1 2.6 Air Conditioning Systems 2	18 30	2.2 Air Conditioning	42
		2.3 Protection and Controls ( <b>new</b> ) – includes Controls and Automation and Basic Analytical Skills	18
1.11 Heating Systems 1 2.5 Heating Systems 2	18 30	2.4 Heating	42
1.12 Water Systems 2.3 Water Systems 2	12 12	2.5 Water Systems	24
2.9 Preventative Maintenance	10	2.6 Facilities Maintenance 2 ( <b>new</b> ) – includes more Building Maintenance and Roofing Systems content	42
1.16 Laundry Systems 1.14 Domestic Appliances	12 12	2.7 Appliances and Laundry Systems	30
		<b>Total</b>	<b>240</b>

**\* Note:** All learning outcomes of previous curricula have been included in the new standards, but have been realigned. Hours listed may not accurately reflect previously assigned hours.

### Reportable Subjects Summary

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
<b>Level One: Common Core with Facilities Technician</b>				
1.1	Safety and Tools	30	25	5
1.2	Communications	24	18	6
1.3	Occupational Calculations	18	18	0
1.4	Plumbing	36	24	12
1.5	Facilities Maintenance 1	48	24	24
1.6	Electricity	42	30	12
1.7	Blueprint Practices	18	12	6
1.8	Brazing and Welding	24	12	12
	<b>Total</b>	<b>240</b>	<b>163</b>	<b>77</b>

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical	Prerequisite
<b>Level 2: Facilities Mechanic</b>					
2.1	Ventilation Systems	42	28	14	1.1, 1.2, 1.3, 1.7
2.2	Air Conditioning	42	28	14	1.1, 1.2, 1.3, 1.7
2.3	Protection and Controls	18	15	3	1.1, 1.2, 1.3, 1.6, 1.7
2.4	Heating	42	28	14	1.1, 1.2, 1.3, 1.7
2.5	Water Systems	24	16	8	1.1, 1.2, 1.3, 1.4, 1.7
2.6	Facilities Maintenance 2	42	21	21	1.1, 1.2, 1.3, 1.5, 1.7
2.7	Appliances and Laundry Systems	30	20	10	1.1, 1.2, 1.3, 1.6, 1.7
	<b>Total</b>	<b>240</b>	<b>156</b>	<b>84</b>	

### Program Summary

**Level 1:** Reportable Subjects – 8      Theory Hours – 163      Practical Hours – 77

**Level 2:** Reportable Subjects – 7      Theory Hours – 156      Practical Hours – 84

**Totals:** Reportable Subjects – **15**      Theory Hours – **319**      Practical Hours – **161**

**Facilities Mechanic and  
Facilities Technician  
Level 1  
Common Core**

**Reportable Subject Summary – Level 1 Common Core with Facilities Mechanic**

<b>Number</b>	<b>Reportable Subjects</b>	<b>Hours Total</b>	<b>Hours Theory</b>	<b>Hours Practical</b>
1.1	Safety and Tools	30	25	5
1.2	Communications	24	18	6
1.3	Occupational Calculations	18	18	0
1.4	Plumbing	36	24	12
1.5	Facilities Maintenance 1	48	24	24
1.6	Electricity	42	30	12
1.7	Blueprint Practices	18	12	6
1.8	Brazing and Welding	24	12	12
	<b>Total</b>	<b>240</b>	<b>163</b>	<b>77</b>

This level is common core between the following trades/occupations:  
Facilities Mechanic 255W.

Number:	1.1		
Title:	Safety and Tools		
Duration:	Total Hours: 30	Theory: 25	Practical: 5
Prerequisites:	None		
Co-requisites:	None		
Cross-Reference to Training Standard: U5070.01 to U5070.10, U5071.01 to U5071.05			

### **General Learning Outcome**

Upon successful completion of the reportable subject, the apprentice is able to explain the health hazards and safety risks that are present on the job site and equip themselves for personal protection and general safety. The apprentice is also able to select, use and maintain hand and power tools.

### **Learning Outcomes**

Upon successful completion, the apprentice is able to:

- 1.1.1 Apply safety legislation outlined in the Occupational Health and Safety Act.
- 1.1.2 Select, wear and maintain personal protective equipment, including respiratory protection.
- 1.1.3 Describe and operate emergency safety equipment.
- 1.1.4 Identify WHMIS labels and MSDS sheets and use safe handling and disposal procedures for hazardous materials.
- 1.1.5 Explain the use of and adjust and wear a fall arrest system.
- 1.1.6 Apply safety measures in shop and on job by following good housekeeping practices.
- 1.1.7 Complete an accident report and describe the need for WSIB and Company insurance forms in case of an accident.
- 1.1.8 Identify confined spaces and describe safe work entry requirements.
- 1.1.9 Identify the need for electrical and mechanical lock out and tag out procedures.

- 1.1.10 Describe the use, care and storage of hoisting and lifting equipment.
- 1.1.11 Accessing information from the Ontario Building Code, operating manuals, and manufacturers' specification sheets, determine the frequency and interval for inspecting a fire safety system and related components.
- 1.1.12 Identify location and layout of all components of a fire safety system.
- 1.1.13 Inspect fire safety system and components on schedule, complying with local by-laws and codes.
- 1.1.14 Identify and describe types of fire doors, fire access routes, stairwell emergency lighting, fire damper access ports, exit signs and "in case of fire" notification signs.
- 1.1.15 Replace bulbs in exit and emergency lights using required voltage/wattage lamps.
- 1.1.16 Inspect and maintain batteries, connections and clamps.
- 1.1.17 Co-ordinate annual inspection of fire safety system.
- 1.1.18 Identify, use and maintain common hand and power tools.
- 1.1.19 Identify, describe the use of, and maintain precision measuring equipment.
- 1.1.20 Identify, describe, use and maintain lifting and hoisting devices following manufacturers' recommendations.
- 1.1.21 Maintain and use grounds maintenance equipment.

### **Learning Content**

- 1.1.1 Apply safety legislation outlined in the Occupational Health and Safety Act.
  - outline sections and describe the application on the work site of the Occupational Health and Safety Act
- 1.1.2 Select, wear and maintain personal protective equipment, including respiratory protection.
  - select respiratory filter for different atmospheres
  - identify protective equipment required for different hazards

- 1.1.3 Describe and operate emergency safety equipment.
- assess operating condition of safety equipment
  - identify classes of fire extinguishers
  - describe and operate fire extinguishers
  - use fire blankets, stretchers, ropes, ladders and other evacuation equipment
- 1.1.4 Identify WHMIS labels and MSDS sheets and use safe handling and disposal procedures for hazardous materials.
- 1.1.5 Explain the use of and adjust and wear a fall arrest system.
- use fall arrest system when working above three meters or confined space
- 1.1.6 Apply safety measures in shop and on job by following good housekeeping practices.
- 1.1.7 Complete an accident report and describe the need for WSIB and Company insurance forms in case of an accident.
- 1.1.8 Identify confined spaces and describe safe work entry requirements.
- 1.1.9 Identify the need for electrical and mechanical lock out and tag out procedures.
- 1.1.10 Describe the use, care and storage of hoisting and lifting equipment.
- 1.1.11 Accessing information from the Ontario Building Code, operating manuals, and manufacturers' specification sheets, determine the frequency and interval for inspecting a fire safety system and related components.
- 1.1.12 Identify location and layout of all components of a fire safety system.
- 1.1.13 Inspect fire safety system and components on schedule, complying with local by-laws and codes.
- record inspection findings in Fire Log Book
  - report inspection findings
  - notify fire monitoring agency of problems that require taking notification system out of service
- 1.1.14 Identify and describe types of fire doors, fire access routes, stairwell emergency lighting, fire damper access ports, exit signs and "in case of fire" notification signs.



- 1.1.15 Replace bulbs in exit and emergency lights using required voltage/wattage lamps.
- 1.1.16 Inspect and maintain batteries, connections and clamps.
- using a hydrometer, check specific gravity of wet cells
  - top up wet cells with distilled water
- 1.1.17 Co-ordinate annual inspection of fire safety system.
- identify an approved contractor
- 1.1.18 Identify, use and maintain common hand and power tools.
- list and describe hand tools such as hammers, saws, chisels, wrenches, screwdrivers, files, pliers, augers, punches, crowbars, and ratchets
- 1.1.19 Identify, describe the use of, and maintain precision measuring equipment.
- describe the use of micrometers, vernier, calipers, tapes, squares, and gauges
  - clean, lubricate and store measuring tools
- 1.1.20 Identify, describe, use and maintain lifting and hoisting devices following manufacturers' recommendations.
- describe applications and limitations of lifting and hoisting devices such as lifts, fork trucks, hydra-lifts and scissor lifts
  - demonstrate safe use of lifting and hoisting devices
  - clean and store lifting and hoisting devices
  - report to authorities any abnormalities with lifting or hoisting devices
- 1.1.21 Maintain and use grounds maintenance equipment.
- list and describe commonly used manual and power grounds maintenance equipment such as mowers, hedge trimmers, leaf blowers, snow blowers and rototillers
  - demonstrate safe use of grounds maintenance equipment
  - clean, lubricate and store grounds equipment

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimum Equipment List:**

MSDS information, WHMIS information, lock out and tagging procedures, hose cabinets, emergency lighting, sprinkler heads, extinguishers, hydrometers, common hand tools, general power tools, safety harness.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
80%	20%	100%

Number:	1.2		
<b>Title:</b>	<b>Communications</b>		
Duration:	Total Hours: 24	Theory: 18	Practical: 6
Prerequisites:	None		
Co-requisites:	None		
Cross-Reference to Training Standard: 5072.01, 5072.03 to 5072.06			

## General Learning Outcomes

Upon successful completion of the reportable subject, the apprentice is able to demonstrate a general knowledge of business and communicate in writing by preparing basic business documents, writing reports, maintaining service documents, and preparing work orders. The apprentice is able to perform computer operations in the preparation of these basic business documents. The apprentice is also able to communicate orally, liaising with staff, tenants, and contractors and demonstrates human relation skills in the process.

## Learning Outcomes

Upon successful completion, the apprentice is able to:

- 1.2.1 Using grammar and language conventions, communicate orally with fellow workers, supervisors, clients, contractors and within organizations.
- 1.2.2 Describe and use communication systems such as telephone/facsimile, postal/courier service, e-mail.
- 1.2.3 Describe the need for and complete written reports and business letters.
- 1.2.4 Complete forms such as service sheets, work order, equipment logs, parts lists, surveys.
- 1.2.5 Communicate effectively using interpersonal skills.
- 1.2.6 Create written documentation using a computer.
- 1.2.7 Prepare a career development plan and resume for work search.
- 1.2.8 Identify requirements of keeping service logs and documents for the equipment and service calls by outside trades persons and contractors.
- 1.2.9 Prepare a work order to schedule services based on work scope and trade required.

## Learning Content

- 1.2.1 Using grammar and language conventions, communicate orally with fellow workers, supervisors, clients, contractors and within organizations.
- open and close a conversation
- 1.2.2 Describe and use communication systems such as telephone/facsimile, postal/courier service, e-mail.
- send fax, ensuring follow-up if required
  - communicate via e-mail
- 1.2.3 Describe the need for and complete written reports and business letters.
- describe types of reports that building operators would use in carrying out their duties
  - describe the use, need for, and requirements of logs and log books
  - write a business letter
  - write a health and safety report
  - write a memo
  - prepare a fax cover letter
  - complete forms required by legislation including WSIB and Ministry of Labour reports
- 1.2.4 Complete forms such as service sheets, work order, equipment logs, parts lists, surveys.
- describe service sheets, work orders, equipment and parts logs
  - prepare work order from maintenance schedule
  - requisition parts
  - prepare WSIB (Workplace Safety Insurance Board) forms
  - explain Ministry of Labour reports commonly used in carrying out the requirements of a building operator
- 1.2.5 Communicate effectively using interpersonal skills.
- demonstrate active listening skills such as paraphrasing, questioning, clarifying, using minimal encouragers, giving constructive feedback
  - describe and demonstrate assertiveness skills versus aggressive and passive aggressive communication
  - communicate with individuals and groups of differing age and cultures
  - resolve interpersonal conflicts by using a problem solving model
- 1.2.6 Create written documentation using a computer.
- demonstrate computer skills by creating documents, sending e-mails, inputting and retrieving equipment data for parts and inventory purposes

- 1.2.7 Prepare a career development plan and resume for work search.
- list interests, skills, past experience
- 1.2.8 Identify requirements of keeping service logs and documents for the equipment and service calls by outside trades persons and contractors.
- record equipment and operation data in approved log book
  - complete service documents
  - access information from government regulations regarding log books and service documents
- 1.2.9 Prepare a work order to schedule services based on work scope and trade required.
- prepare work orders to schedule services of qualified and licensed trades persons

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimum Equipment List:**

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
50%	50%	100%

Number:	1.3		
Title:	Occupational Calculations		
Duration:	Total Hours: 18	Theory: 18	Practical: 0
Prerequisites:	None		
Co-requisites:	None		
Cross-Reference to Training Standard: There are no specific General Performance Objectives for this module.			

### General Learning Outcome

Upon successful completion of the reportable subject, the apprentice is able to solve trade related calculations and problems involving basic arithmetic, geometry and mathematical functions.

### Learning Outcomes

Upon successful completion, the apprentice is able to:

- 1.3.1 Using basic arithmetic functions, add, subtract, multiply, and divide.
- 1.3.2 Calculate perimeter, area, volume of geometric shapes and figures.
- 1.3.3 Measure angles, sides of objects, and calculate using Pythagorean theorem.
- 1.3.4 Calculate basic algebraic functions with one unknown.
- 1.3.5 Using a hand-held calculator, perform required calculations.
- 1.3.6 Using imperial and metric measurement, calculate mass, volume and length.
- 1.3.7 Calculate using given formulae, basic trade related problems.

### Learning Content

- 1.3.1 Using basic arithmetic functions, add, subtract, multiply, and divide.
- 1.3.2 Calculate perimeter, area, volume of geometric shapes and figures.
  - calculate perimeters, areas and volumes of given plane figures
- 1.3.3 Measure angles, sides of objects, and calculate using Pythagorean theorem.
  - define angle/angles, and accurately read angles using protractors
  - calculate triangle components using the Pythagorean theorem

- 1.3.4 Calculate basic algebraic functions with one unknown.
- solve given algebraic equations/problems
- 1.3.5 Using a hand-held calculator, perform required calculations.
- 1.3.6 Using imperial and metric measurement, calculate mass, volume and length.
- transpose between both modes of measurement.
- 1.3.7 Calculate using given formulae, basic trade related problems.
- using formulae, solve for an unknown given pertinent data

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimal Equipment List:**

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
100%	0%	100%

Number:	1.4		
<b>Title:</b>	<b>Plumbing 1</b>		
Duration:	Total Hours: 36	Theory: 24	Practical: 12
Prerequisites:	None		
Co-requisites:	None		
Cross-Reference to Training Standard: 5080.0, 5087.01			

### General Learning Outcome

Upon successful completion of the reportable subject, the apprentice is able to install and maintain plumbing fixtures by accessing the plumbing code, reading and interpreting blueprints and schematics, identifying and locating defective area of plumbing system, inspecting water drains, and performing routine maintenance.

### Learning Outcomes

Upon successful completion, the apprentice is able to:

- 1.4.1 Identify and describe plumbing system components.
- 1.4.2 Identify piping materials and explain the methods employed for connecting piping in plumbing systems.
- 1.4.3 Interpreting blueprints, drawings, and piping schematics, identify layout and location of components in plumbing systems.
- 1.4.4 Select piping and tubing used for appliances according to Gas Utilization codes.
- 1.4.5 Install gas piping and tubing systems using pipe sizing charts and according to Gas Utilization codes.
- 1.4.6 Visually inspect plumbing system components.
- 1.4.7 Record temperatures, pressures, levels, flows, and other information and maintain a history of piping and plumbing system components.
- 1.4.8 Set recording gauges using master gauge.
- 1.4.9 Identify and explain types of plumbing systems.
- 1.4.10 Maintain and repair minor defects on hot water tank components.



- 1.4.11 Identify and describe types of valves on plumbing systems.
- 1.4.12 Re-pack valves using manufacturers' approved procedures.
- 1.4.13 Identify and describe types of faucets used in sinks, vanities, bathtubs and repair defective or leaking faucets.
- 1.4.14 Identify and explain the theory of operation of a flushometer, a water closet float valve and urinal gravity tanks and repair or replace defective parts.
- 1.4.15 Maintain, repair, or replace p-traps on vanities and sinks.

### **Learning Content**

- 1.4.1 Identify and describe plumbing system components.
  - describe the function and application of plumbing system components for both drinking and potable water supply such as domestic water; hot water; drain-waste-vent piping systems, valves, faucets and taps; washroom components; circulating pumps and tanks; gages
- 1.4.2 Identify piping materials and explain the methods employed for connecting piping in plumbing systems.
  - describe types of piping material such as copper, steel, plastic, galvanized steel, PVC, tubing
  - state the application of pipe used in plumbing, including vents
- 1.4.3 Interpreting blueprints, drawings, and piping schematics, identify layout and location of components in plumbing systems.
  - draw a sketch of a section of a plumbing system
- 1.4.4 Select piping and tubing used for appliances according to Gas Utilization codes.
  - types of gas piping, tubing and material characteristics of copper, steel, plastic, flexible stainless steel tubing and hose
  - utilize pipe sizing diagrams for pipe
  - select piping for installation in underground, indoor and outdoor
  - outline use of flexible piping

- 1.4.5 Install gas piping and tubing systems using pipe sizing charts and according to Gas Utilization codes.
- describe types of fittings, threaded, flare, welded, compression and brazing
  - explain procedures for joining pipe together
  - perform following procedures such as cutting pipe to meet size, bend tubing, thread pipe and solder pipe up to 2 inches, flare tubing
  - install plastic pipe fittings
- 1.4.6 Visually inspect plumbing system components.
- manually close valves to isolate defective units, leaks and for preventative maintenance work
  - use mechanical tag-out to ensure safety
  - identify and record defects in plumbing
  - complete plumbing work order
  - arrange for emergency repair by plumber or contractor
- 1.4.7 Record temperatures, pressures, levels, flows, and other information and maintain a history of piping and plumbing system components.
- accurately read temperatures, pressures flows and levels
  - record on approved log sheets
- 1.4.8 Set recording gauges using master gauge.
- adjust and calibrate floats, mixing valves, regulators and monitoring gauges
- 1.4.9 Identify and explain types of plumbing systems.
- describe function and purpose of domestic cold water down-flow, up-flow
  - describe function and purpose of gravity, tank-less constant pressure
  - describe function and purpose of domestic hot water down-flow, up-flow drain
  - describe function and purpose of waste and vent (DWV)
  - identify plumbing systems layouts
- 1.4.10 Maintain and repair minor defects on hot water tank components.
- test water tank relief valves
  - flush tank, clean tank as required by the p.m. schedule
  - co-ordinate with contractor or trades person to repair complex jobs

- 1.4.11 Identify and describe types of valves on plumbing systems.
- identify valve components such as gate valves, globe valves, ball valves, angle valves, sediment valves, check valves, and diaphragm valves
- 1.4.12 Re-pack valves using manufacturers' approved procedures.
- 1.4.13 Identify and describe types of faucets used in sinks, vanities, bathtubs and repair defective or leaking faucets.
- describe the types of faucets such as washer type, washer-less and cartridge type and state their applications in commercial buildings
- 1.4.14 Identify and explain the theory of operation of a flushometer, a water closet float valve and urinal gravity tanks and repair or replace defective parts.
- explain the theory of operation of flushometers, float valves and gravity tanks
- 1.4.15 Maintain, repair, or replace p-traps on vanities and sinks.
- identify p-traps
  - clean p-traps
  - perform preventative and regular maintenance on p-traps

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimal Equipment List:**

Domestic water, hot water tank, drain-waste-vent piping systems, valves, faucets, washroom components, circulating pumps, gas piping and fittings.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
70%	30%	100%

Number:	1.5		
<b>Title:</b>	<b>Facilities Maintenance 1</b>		
Duration:	Total Hours: 48	Theory: 24	Practical: 24
Prerequisites:	None		
Co-requisites:	None		
Cross-Reference to Training Standard: 5083.0, 5084.0, 5085. 0			

### General Learning Outcome

Upon successful completion of the reportable subject, the apprentice is able to inspect, maintain and troubleshoot building envelope by accessing information; conducting visual and physical inspection; repairing/replacing doors/components and windows/components; planning and estimating replacement paint and wall coverings; preparing wall surfaces; applying paint and wall coverings; maintaining ceilings, interior surfaces, exterior brickwork, masonry, cladding, wall appendages, and floor coverings; performing general cleaning procedures; and performing scheduled maintenance on overhead suspended equipment. The apprentice is also able to perform grounds maintenance by accessing information; conducting a visual and physical inspection of exterior grounds; cleaning up grounds; maintaining ground facilities, lawn and garden equipment; maintaining lawns, plants, trees, flora, and shrubs; inspecting, maintaining, and testing irrigation systems, and inspecting and maintaining playground equipment.

### Learning Outcomes

Upon successful completion, the apprentice is able to:

- 1.5.1 Conduct a visual inspection of exterior grounds, record deficiencies and issue work orders for repair or replacement of items or components that cannot be done in-house.
- 1.5.2 Identify and describe procedures for waste disposal, recycling, garbage removal, snow and ice removal, leaf and debris removal.
- 1.5.3 Identify and describe materials used in the upkeep of the building exterior, sidewalks, driveways, fences and patios.
- 1.5.4 Maintain and perform minor repairs to building exterior and grounds.
- 1.5.5 Identify and describe gardening procedures including layout, plant selection, plant care, weeding, fertilizing, watering and pest control.
- 1.5.6 Identify and describe use of trees and types of lawn cover and maintenance required.

- 1.5.7 Perform visual inspection of lawn equipment.
- 1.5.8 Identify and describe theory of operation of underground irrigation system and components.
- 1.5.9 Prepare an annual maintenance and start-up/shut-down procedures for lawn irrigation systems.
- 1.5.10 Identify and describe components of playground equipment and maintenance requirements, and maintain and perform minor repairs on playground equipment.
- 1.5.11 Perform maintenance for interior envelope such as doors and windows, painted and covered walls, ceiling tile, floors, carpets and railings.
- 1.5.12 Perform housekeeping and cleaning requirements.
- 1.5.13 Identify required maintenance and describe the repair procedures for components of the building envelope.
- 1.5.14 Prepare interior surfaces.
- 1.5.15 Identify and describe types and procedures for application of paints and adhesives used for interior and exterior coating.
- 1.5.16 Demonstrate procedure to apply coatings to interior and exterior surfaces.
- 1.5.17 Calculate paint/wall covering and labor requirements for interior and exterior applications.
- 1.5.18 Prepare building exterior surfaces for painting.
- 1.5.19 Select caulking for expansion joints and remove and apply new caulking.
- 1.5.20 Remove deteriorated brick and mortar and repair.
- 1.5.21 Remove defective cladding and replace.
- 1.5.22 Describe and demonstrate maintenance requirements for eaves troughs and down spouts.
- 1.5.23 Identify, describe and demonstrate procedures to clean interior and exterior surfaces.
- 1.5.24 Inspect components of building envelope, record deficiencies and issue work orders or long term maintenance requirements.

- 1.5.25 Identify types of windows and doors used in building construction and replace/repair defective components.
- 1.5.26 Remove old wall covering, prepare surfaces, select and apply new wall coverings.
- 1.5.27 Identify and describe types of ceilings, ceiling tiles, plaster, and drywall and maintain and repair defective ceiling components, drywall, plaster, cement, block and other types of walls.
- 1.5.28 Identify and describe types of interior surfaces, maintain and perform minor repairs to walls.
- 1.5.29 Select types of fasteners used in building construction, and install or replace fasteners used to hold handrails and shelving.
- 1.5.30 Identify and describe types of floor coverings used in buildings, perform minor floor repairs, and coordinate contractors to repair or replace major deficiencies in floor coverings.
- 1.5.31 Identify and describe suspended equipment, overhead door hardware, mechanical and electrical door components, tracks, springs, rollers, bearings and cables and maintain components.
- 1.5.32 Identify and describe types of roofs and interpret roofing blueprints and drawings.
- 1.5.33 Inspect/repair roof following building and OSHA guidelines.

### **Learning Content**

- 1.5.1 Conduct a visual inspection of exterior grounds, record deficiencies and issue work orders for repair or replacement of items or components that cannot be done in-house.
- inspect weeds, crab grass, hedge trimming; condition of curbs, stones, sidewalks, driveways; condition and appearance of shrubs, flowers, trees; general landscape appearance
  - arrange for contractors to perform required work
  - describe how landscape features such as shrubs, flowers, and trees are used to provide a pleasant/esthetic appearance
- 1.5.2 Identify and describe procedures for waste disposal, recycling, garbage removal, snow and ice removal, leaf and debris removal.
- explain the ways in which snow and ice are removed from walkways, driveways and building rooftops

- 1.5.3 Identify and describe materials used in the upkeep of the building exterior, sidewalks, driveways, fences and patios.
- describe methods used to perform repairs to components of building exterior
- 1.5.4 Maintain and perform minor repairs to building exterior and grounds.
- clean building exterior and grounds
  - coordinate contractor or trades person for major repairs to building
- 1.5.5 Identify and describe gardening procedures including layout, plant selection, plant care, weeding, fertilizing, watering and pest control.
- name the commonly used types of plants and shrubbery utilized on building grounds
  - describe methods used to control lawn weeds, lawn fertilizing
- 1.5.6 Identify and describe use of trees and types of lawn cover and maintenance required.
- describe different varieties of trees
  - explain the use of trees and shrubs for shade, noise barriers and wind breaks
  - describe maintenance such as cutting, fertilizing and pest control
- 1.5.7 Perform visual inspection of lawn equipment.
- check that lubrication and fuel are at satisfactory levels, blades will cut and not rip grass
  - recognize that the inspection is to be carried out on lawn equipment prior to its use
  - demonstrate the safe way to add fuel to lawn cutting and snow removal equipment
- 1.5.8 Identify and describe theory of operation of underground irrigation system and components.
- identify the components of an underground irrigation system
  - describe maintenance requirements of underground irrigation systems
- 1.5.9 Prepare an annual maintenance and start-up/shut-down procedures for lawn irrigation systems.
- use preventative maintenance schedule to determine start up and shut down of irrigation system

- 1.5.10 Identify and describe components of playground equipment and maintenance requirements, and maintain and perform minor repairs on playground equipment.
- access manufacturers' specifications for maintenance and repair of playground equipment
  - clean playground equipment
  - eliminate play ground equipment defects immediately
- 1.5.11 Perform maintenance for interior envelope such as doors and windows, painted and covered walls, ceiling tile, floors, carpets and railings.
- 1.5.12 Perform housekeeping and cleaning requirements.
- vacuum premises
  - strip and buff floors
  - surface wash and polish
  - accessing information on the safe use of chemicals and cleaning solvents from MSDS and WHMIS, clean and police area
- 1.5.13 Identify required maintenance and describe the repair procedures for components of the building envelope.
- repair doors, windows, glass/screens, security monitoring systems
  - replace weather stripping
  - demonstrate caulking procedures and screen replacement
  - select and install/replace door hinges/locks, monitoring components such as cameras and screens
- 1.5.14 Prepare interior surfaces.
- describe procedures to prepare concrete, masonry, glass, tile and vinyl surfaces for painting, vinyl covering or plastering
  - sand, prime, and paint interior surfaces
- 1.5.15 Identify and describe types and procedures for application of paints and adhesives used for interior and exterior coating.
- state the differences between, and specific applications for flat and semi-gloss latex, alkyd, and oil based paints
  - describe types of adhesives used for interior and exterior wall coatings
- 1.5.16 Demonstrate procedure to apply coatings to interior and exterior surfaces.
- demonstrate ability to apply coatings by brush, rolling and paint sprayer
  - tape and cover items not to be painted



- 1.5.17 Calculate paint/wall covering and labor requirements for interior and exterior applications.
- measure surface area to be covered or painted and calculate paint or covering required
  - issue work order to contractor or trades person to complete large jobs
- 1.5.18 Prepare building exterior surfaces for painting.
- safely assemble scaffolding
  - demonstrate safe use of ladders
  - demonstrate use of power washer to clean exterior surfaces
  - clean/scrape and prime exterior surface
- 1.5.19 Select caulking for expansion joints and remove and apply new caulking.
- apply caulking using both the hand and the power gun
- 1.5.20 Remove deteriorated brick and mortar and repair.
- describe the procedure for mixing amounts of mortar and apply to defective area
- 1.5.21 Remove defective cladding and replace.
- 1.5.22 Describe and demonstrate maintenance requirements for eaves troughs and down spouts.
- demonstrate use of ladders and scaffold equipment when accessing eaves trough and down spouts.
  - clean eaves troughs by removing debris and leaves
  - select sealant for sealing eaves and down spouts
  - reseal joints using caulking or sealing material
  - replace defective eaves and spout fasteners
  - repair eaves troughs and down spouts
- 1.5.23 Identify, describe and demonstrate procedures to clean interior and exterior surfaces.
- describe terrazzo floors, concrete floors, cement walls
  - describe equipment used to clean wall and floor surfaces
  - shampoo carpets
  - sandblast, acid wash and high pressure water wash concrete floors, brickwork, and cladding
- 1.5.24 Inspect components of building envelope, record deficiencies and issue work orders or long term maintenance requirements.
- record on log sheets, defects and deficiencies found
  - prepare a preventative maintenance check list for the building envelope

- 1.5.25 Identify types of windows and doors used in building construction and replace/repair defective components.
- repair or replace operators, screens, broken window panes, door seals, hinges, door handles, bottom door sweeps
  - adjust doors for closing
  - replace doors
  - replace/install door hinges
  - select and apply caulking and sealant to windows, doors and openings
- 1.5.26 Remove old wall covering, prepare surfaces, select and apply new wall coverings.
- identify and demonstrate use of tools and equipment to remove old wall coverings
  - prepare surfaces by filling holes, sanding, and repairing any cracks
- 1.5.27 Identify and describe types of ceilings, ceiling tiles, plaster, and drywall and maintain and repair defective ceiling components, drywall, plaster, cement, block and other types of walls.
- remove defective ceiling tiles
  - describe types of ceiling tiles commonly used in facilities ceilings
  - prepare surface, patch and repair plastered ceiling
- 1.5.28 Identify and describe types of interior surfaces, maintain and perform minor repairs to walls.
- recognize types of materials used for interior walls for cleaning
  - clean walls using recommended cleaning solutions
  - perform minor wall repairs to plaster, wallboard, baseboards, corners
- 1.5.29 Select types of fasteners used in building construction, and install or replace fasteners used to hold handrails and shelving.
- describe types of fasteners such as nails, screws, shelf brackets, handrail brackets, adhesives
  - using tools and equipment such as brackets and fasteners, install handrails, shelving, and brackets
- 1.5.30 Identify and describe types of floor coverings used in buildings, perform minor floor repairs, and coordinate contractors to repair or replace major deficiencies in floor coverings.
- issue work orders for contractors for larger repairs

- 1.5.31 Identify and describe suspended equipment, overhead door hardware, mechanical and electrical door components, tracks, springs, rollers, bearings and cables and maintain components.
- clean and lubricate overhead components using ladders or scaffolding
  - perform preventative maintenance on overhead equipment
  - note defects and record in log for follow up
- 1.5.32 Identify and describe types of roofs and interpret roofing blueprints and drawings.
- interpret type of roof construction
  - obtain information from Ontario Building Code Municipal bylaws and manufacturers' specifications
  - identify type of roof to be accessed
- 1.5.33 Inspect/repair roof following building and OSHA guidelines.
- locate roof construction details from blueprints
  - demonstrate use of safety harness when performing roof repairs
  - describe requirements of installing roof barricades
  - check for signs of deterioration, visible defects, damaged flashing, ripped shingles, ponding of water, plugged roof drains
  - complete work order for repair and coordinate contractor for large repairs
  - describe tools and equipment used for repair of roof shingles
  - seal or patch damaged roof shingles and roof flashing applying sealants, caulking or patching compounds

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimum Tools and Equipment:**

Doors, windows, weather stripping, caulking, locks, irrigation equipment, playground equipment, safety barriers, required safety equipment, cant strips, curbs, flashing, roofing materials, ladders, scaffolding, common hand tools, vacuum cleaners, floor strippers, floor buffers, painting equipment, brick laying equipment, grounds care equipment, house keeping/cleaning equipment and chemicals.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	25%	100%

Number:	1.6		
<b>Title:</b>	<b>Electricity</b>		
Duration:	Total Hours: 42	Theory: 30	Practical: 12
Prerequisites:	None		
Co-requisites:	None		
Cross-Reference to Training Standard: 5075.0			

### General Learning Outcome

Upon successful completion of the reportable subject, the apprentice is able to inspect and maintain electrical systems by accessing information, reading and interpreting blueprints and shop drawings, inspecting electrical systems and components, maintaining breakers and fuses (maximum of 240 volts), and maintaining 120 volts, single phase electrical components and devices.

### Learning Outcomes

Upon successful completion, the apprentice is able to:

- 1.6.1 Define the units of electrical measurement.
- 1.6.2 Using Ohm's and Joules' Laws, solve common electrical circuits.
- 1.6.3 Using theories of magnetism, explain the operation of electromagnetic devices.
- 1.6.4 Accessing information from Canadian Electrical Code, local bylaws, and company standards, identify safety procedures, specifications and limitations for maintenance and repair of electrical systems.
- 1.6.5 Using blueprints and shop drawings, identify layout and location of main breakers, branch panels, transformers, and disconnects.
- 1.6.6 Visually inspect distribution system to determine voltage and system characteristics.
- 1.6.7 Visually inspect electrical components and use the electrical lock-out tag/out procedure when taking a piece of equipment out of service for maintenance.
- 1.6.8 Identify and describe the application of meters used in electrical measurement.

- 1.6.9 Identify and describe types of electrical service metering devices, read, record and calculate electrical consumption.
- 1.6.10 Identify and describe types of electrical control and isolation equipment.
- 1.6.11 Check circuit breakers and fuses (up to 240 volts) for correct operation.
- 1.6.12 Select and replace defective receptacles, switches and lamps sockets.
- 1.6.13 Select and replace defective or burnt out fluorescent ballasts and other components.
- 1.6.14 Reset motor starter, check and replace fuses in disconnects and perform current draw measurements while motor is operating.
- 1.6.15 Visually inspect main electrical room components.

### **Learning Content**

- 1.6.1 Define the units of electrical measurement.
- 1.6.2 Using Ohm's and Joules' Laws, solve common electrical circuits.
- 1.6.3 Using theories of magnetism, explain the operation of electromagnetic devices.
- 1.6.4 Accessing information from Canadian Electrical Code, local bylaws, and company standards, identify safety procedures, specifications and limitations for maintenance and repair of electrical systems.
- 1.6.5 Using blueprints and shop drawings, identify layout and location of main breakers, branch panels, transformers, and disconnects.
  - locate electrical components and wiring location
- 1.6.6 Visually inspect distribution system to determine voltage and system characteristics.
  - identify single phase systems
  - identify three phase systems
  - determine safety precautions
- 1.6.7 Visually inspect electrical components and use the electrical lock-out tag/out procedure when taking a piece of equipment out of service for maintenance.
  - record abnormal situations
  - lock-out before inspecting electrical systems and equipment
  - recognize and ensure compliance with trade limitations

- 1.6.8 Identify and describe the application of meters used in electrical measurement.
- describe fuse pullers, wire strippers, insulated pliers, linesman pliers, screwdrivers, voltage tester and other tools used
- 1.6.9 Identify and describe types of electrical service metering devices, read, record and calculate electrical consumption.
- demonstrate ability to use meter in safe manner
  - measure voltage, amperage and resistance
- 1.6.10 Identify and describe types of electrical control and isolation equipment.
- identify and describe electrical safety equipment such as fuses, circuit breakers, ground fault interrupters, motor starters and disconnects
- 1.6.11 Check circuit breakers and fuses (up to 240 volts) for correct operation.
- describe circuit breakers and fuses
  - use tools and equipment such as puller to remove fuses
  - demonstrate use of multi-meters and clamp-on meter to test fuses and breakers
  - test using a multi-meter
  - replace with required fuse
  - reset circuit breaker
- 1.6.12 Select and replace defective receptacles, switches and lamps sockets.
- use lock-out/tag-out procedure to safely isolate defective components
  - use tools and materials to replace defective switches and receptacles
- 1.6.13 Select and replace defective or burnt out fluorescent ballasts and other components.
- identify ballast and light components
  - visually inspect nameplate data on ballasts
- 1.6.14 Reset motor starter, check and replace fuses in disconnects and perform current draw measurements while motor is operating.
- use clamp-on ammeter to check current
  - use multi-meter to check voltage
  - test fuse and replace with required fuse if defective
- 1.6.15 Visually inspect main electrical room components.
- log electrical equipment readings and note deficiencies
  - contact trades persons for repair

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimum Tools and Equipment:**

Low voltage transformer, breakers, fuses, electrical panels – single phase and three phase, lighting fixtures, ballasts, motors and starters, common electrical hand tools, multimeter, clamp-on ammeter.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	25%	100%

Number:	1.7		
<b>Title:</b>	<b>Blueprint Practices</b>		
Duration:	Total Hours: 18	Theory: 12	Practical: 6
Prerequisites:	None		
Co-requisites:	None		
Cross-Reference to Training Standard: 5072.02			

### General Learning Outcome

Upon successful completion of the reportable subject, the apprentice is able to reference building codes, identify and interpret types of architectural, structural and mechanical drawings, sketch views and sections of building components.

### Learning Outcomes

Upon successful completion, the apprentice is able to:

- 1.7.1 Identify and draw perspective, isometric, oblique and orthographic projections.
- 1.7.2 Identify and draw views and sections.
- 1.7.3 Identify and explain the Alphabet of Lines.
- 1.7.4 Create orthographic drawings in one view, two views, and three views.
- 1.7.5 Name the features of a building in the plan and elevation views.
- 1.7.6 Explain the necessity of building codes in the industry.
- 1.7.7 Create basic drawings, using commercially available Computer Assisted Design (CAD) software.

### Learning Content

- 1.7.1 Identify and draw perspective, isometric, oblique and orthographic projections.
  - draw projections using scale rulers, triangles, compass and other related tools



- 1.7.2 Identify and draw views and sections.
- search components located in each of the different views
  - draw views such as front view, side view, plan (top) view, sections and details, abbreviations, and title blocks
- 1.7.3 Identify and explain the Alphabet of Lines.
- explain use of lines
  - explain object lines, hidden lines, extension lines, centerlines, cutting plane lines, break lines
  - describe location of each type of line
- 1.7.4 Create orthographic drawings in one view, two views, and three views.
- use tools and Alphabet of Lines to create a drawing
- 1.7.5 Name the features of a building in the plan and elevation views.
- identify features using nomenclature
- 1.7.6 Explain the necessity of building codes in the industry.
- identify types of provincial building codes and municipal bylaws
- 1.7.7 Create basic drawings, using commercially available Computer Assisted Design (CAD) software.

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimum Tools and Equipment:**

Drawings, CAD software and computer, drafting tools.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
50%	50%	100%

Number:	1.8		
Title:	Brazing and Welding		
Duration:	Total Hours: 24	Theory: 12	Practical: 12
Prerequisites:	None		
Co-requisites:	None		
Cross-Reference to Training Standard:	5086.0		

### General Learning Outcome

Upon successful completion of the reportable subject, the apprentice is able to set up and operate oxyacetylene and arc welding equipment. The apprentice will prepare weld surfaces, weld, then disconnect and store welding equipment.

### Learning Outcomes

Upon successful completion, the apprentice is able to:

- 1.8.1 Identify and explain principles of oxyacetylene brazing and the arc welding operation.
- 1.8.2 Identify and describe equipment used in brazing and welding.
- 1.8.3 Select, adjust, and wear protective equipment.
- 1.8.4 Plan and organize welding or brazing operation.
- 1.8.5 Set up welding machine and select ground clamp locations, polarity and welding rods.
- 1.8.6 Using grinder and files, prepare welding surface and identify and describe type of weld to be used.
- 1.8.7 Demonstrate arc welding, brazing, and cutting procedures.
- 1.8.8 Demonstrate safety procedures when welding and brazing.
- 1.8.9 Using storage techniques, safely store equipment, tools, parts and compressed gas cylinders, according to manufacturers' specifications, and OHSA guidelines.

## Learning Content

- 1.8.1 Identify and explain principles of oxyacetylene brazing and the arc welding operation.
- 1.8.2 Identify and describe equipment used in brazing and welding.
- describe torches, regulators, compressed oxygen and acetylene, arc welding machine, clamps, strikers, welding rods, brazing rods, fluxes, grinders, and other related devices
  - describe care and use of brazing and welding equipment
- 1.8.3 Select, adjust, and wear protective equipment.
- demonstrate use of protective clothing and related personal safety equipment such as eye protection, welding shields, gloves, aprons and hearing protection
- 1.8.4 Plan and organize welding or brazing operation.
- read and interpret blueprints and shop drawings to plan out welding or brazing operation
  - access work scope
  - demonstrate use of tools and equipment
  - select brazing and/or welding rods and flux
  - select heat settings
- 1.8.5 Set up welding machine and select ground clamp locations, polarity and welding rods.
- access welding machine set up information from manufacturers' specifications and operating procedures
  - ensure ground clamp locations, polarity and required welding rod is utilized
  - demonstrate safe set up of welding machine
  - test machine to verify settings
- 1.8.6 Using grinder and files, prepare welding surface and identify and describe type of weld to be used.
- describe types of welds commonly used such as butt, lap, groove, or fillet weld
- 1.8.7 Demonstrate arc welding, brazing, and cutting procedures.

- 1.8.8 Demonstrate safety procedures when welding and brazing.
- keep area free of combustibles
  - have fire extinguisher standing by
  - use accepted OHSA guidelines
  - describe the duties of safety/spark watcher during welding operations
- 1.8.9 Using storage techniques, safely store equipment, tools, parts and compressed gas cylinders, according to manufacturers' specifications, and OHSA guidelines.
- demonstrate disconnection and storage of welding equipment
  - describe the requirements for the safe storage of gas cylinders

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimum Equipment List:**

Welding equipment, electric or oxyacetylene brazing.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
50%	50%	100%

# **Facilities Mechanic Level 2**

**Reportable Subject Summary-Level 2**

<b>Number</b>	<b>Reportable Subjects</b>	<b>Hours Total</b>	<b>Hours Theory</b>	<b>Hours Practical</b>
2.1	Ventilation Systems	42	28	14
2.2	Air Conditioning	42	28	14
2.3	Protection and Controls	18	15	3
2.4	Heating	42	28	14
2.5	Water Systems	24	16	8
2.6	Facilities Maintenance 2	42	21	21
2.7	Appliances and Laundry Systems	30	20	10
	<b>Total</b>	<b>240</b>	<b>156</b>	<b>84</b>

Number:	2.1		
Title:	<b>Heating Systems 1</b>		
Duration:	Total Hours: 30	Theory: 20	Practical: 10
Prerequisites:	1.1, 1.2, 1.3, 1.7		
Co-requisites:	None		
Cross Reference to Training Standards:	5100.0		

## General Learning Outcomes

Upon successful completion of the reportable subject, the apprentice is able to operate and maintain fume/exhaust hoods by accessing information; reading and interpreting blueprints, shop drawings and schematics; and coordinating certification for fume/exhaust hoods. The apprentice will also be able to inspect, maintain and troubleshoot ventilation systems by accessing information; reading and interpreting blueprints and schematics; inspecting, troubleshooting, and maintaining ventilation systems and components; checking and cleaning ductwork and grills; inspecting and maintaining humidifier systems; and performing scheduled preventative maintenance procedures.

## Learning Outcomes

Upon successful completion, the apprentice is able to:

- 2.1.1 Identify types and components and explain the purpose of ventilation and air handling systems.
- 2.1.2 Identify layout and location of ventilation system components.
- 2.1.3 Visually inspect ventilation and air handling systems.
- 2.1.4 Replace filters in ventilation systems as per preventative maintenance schedule.
- 2.1.5 Clean grilles, ductwork, registers, diffusers.
- 2.1.6 Access information relating to safety standards and codes for ventilation and air handling systems from Ontario Building Code, National Fire Prevention Act, the American Society of Heating, Refrigeration and Air- Conditioning Engineers (ASHRAE) standards and OHSA, Ontario Propane Gas Utilization Code, Ontario Natural Gas Utilization Code, Technical Standards and Safety Act (Fuels Safety Regulation), CAN/CSA – Z240 Mobile Homes, CAN/CSA – Z241 Park Model Trailers.

- 2.1.7 Identify location, layout of equipment and related components of fume exhaust hoods.
- 2.1.8 Identify properties of propane gas and natural gas.
- 2.1.9 Investigate natural gas and propane escapes using appropriate tools and tests.
- 2.1.10 Investigate fumes and odours such as carbon monoxide using appropriate tools and test procedures.
- 2.1.11 Describe the principles of fume/exhaust hoods operation.
- 2.1.12 Perform scheduled shutdown procedures for preventative maintenance or emergency repair of a fume/exhaust hoods.
- 2.1.13 Repair, adjust or replace components of fume exhaust hoods.
- 2.1.14 Using approved testing equipment, perform smoke and airflow test.
- 2.1.15 Coordinate certification of fume/exhaust hood.
- 2.1.16 Record visual inspections, testing, repairs, alterations or adjustments.
- 2.1.17 Identify and explain the principle of operation of air handling systems.
- 2.1.18 Identify and describe types of air filter systems.
- 2.1.19 Identify and describe types of coils found in air handling systems.
- 2.1.20 Maintain finned coils found in ventilation systems.
- 2.1.21 Identify and describe types of humidification systems.
- 2.1.22 Maintain and replace components of humidifiers.
- 2.1.23 Identify and describe types of fan systems.
- 2.1.24 Select, replace and adjust tension on belts used on fan systems.
- 2.1.25 Inspect fan and motor bearings.
- 2.1.26 Identify and correct deficiencies and balance fan.



## Learning Content

- 2.1.1 Identify types and components and explain the purpose of ventilation and air handling systems.
- explain distribution systems and exhaust systems
  - describe components such as dampers, filters, coils humidifiers, fans, mixing boxes, and controls devices
  - describe an air handling system
  - describe the difference between an air distribution system and exhaust system
- 2.1.2 Identify layout and location of ventilation system components.
- read and interpret blueprints and schematics relating to ventilation system components
- 2.1.3 Visually inspect ventilation and air handling systems.
- describe methods and equipment used to ensure air is conditioned
  - inspect filters, coils, humidifiers, fans, mixing boxes and other related components
  - record data
  - issue work orders for repairs or deficiencies
- 2.1.4 Replace filters in ventilation systems as per preventative maintenance schedule.
- select replacement filter
  - describe types of filters used to remove particulates
  - order specific filters applicable to its function
  - restore / replace dirty filter bags, rolls, viscous media, using tools and equipment
- 2.1.5 Clean grilles, ductwork, registers, diffusers.
- vacuum, wash, and remove obstructions
  - visually check and determine if air dispersing units need cleaning
  - remove, clean, and replace components after cleaning
- 2.1.6 Access information relating to safety standards and codes for ventilation and air handling systems from Ontario Building Code, National Fire Prevention Act, the American Society of Heating, Refrigeration and Air- Conditioning Engineers (ASHRAE) standards and OHSA, Ontario Propane Gas Utilization Code, Ontario Natural Gas Utilization Code, Technical Standards and Safety Act (Fuels Safety Regulation), CAN/CSA – Z240 Mobile Homes, CAN/CSA – Z241 Park Model Trailers.

- 2.1.7 Identify location, layout of equipment and related components of fume exhaust hoods.
- read and interpret blueprints and schematics regarding exhaust hoods and components
  - check Government guidelines for safety information regarding fume hoods
- 2.1.8 Identify properties of propane gas and natural gas.
- specific gravity, density, upper and lower explosive limits, flame speed characteristics of propane and natural gas, colour, odour, toxicity
  - identify odorants added to propane and natural gas
  - differentiate between complete combustion and incomplete combustion of gas
  - determine products of combustion for both gases
- 2.1.9 Investigate natural gas and propane escapes using appropriate tools and tests.
- perform tests such as pressure test, soap test and combustible gas indicators
  - recognize potential sources of ignition such as light switches, spark ignition, open flame, door bells, telephones
  - demonstrate how and when to ventilate and how to evacuate an explosive environment
  - describe how propane and natural gas migrates through soil and air
- 2.1.10 Investigate fumes and odours such as carbon monoxide using appropriate tools and test procedures.
- perform CO tests using mechanical air sampling and electronic analysers
  - describe causes of incomplete combustion such as flame impingement
  - cracked heat exchanger, blocked vent and chimney
  - negative air pressure or insufficient combustion air
  - describe corrosive effects of combustion gases
  - determine ventilation and evacuation procedures for toxic gases
- 2.1.11 Describe the principles of fume/exhaust hoods operation.
- identify location and venting requirements
- 2.1.12 Perform scheduled shutdown procedures for preventative maintenance or emergency repair of a fume/exhaust hoods.
- prepare work orders to test, repair and maintain fume hood and its system
- 2.1.13 Repair, adjust or replace components of fume exhaust hoods.
- repair or replace belts, pulley, bearings, shafts, motors, dampers, seals ductwork, switches, and other related components

- 2.1.14 Using approved testing equipment, perform smoke and airflow test.
- test limits and alarms
  - ensure fume/exhaust hoods meet environmentally acceptable standards
  - record results
- 2.1.15 Coordinate certification of fume/exhaust hood.
- scheduling approved testing on cylinders, carbon dioxide cylinders
  - meet NFPA standards that may be required in the municipality or company
  - inspect and record aspects of fume hood maintenance
  - procure and schedule qualified technician or contractor
- 2.1.16 Record visual inspections, testing, repairs, alterations or adjustments.
- record results of certification tests in the approved logbooks
  - maintain accessibility to insurance or Fire Marshall
- 2.1.17 Identify and explain the principle of operation of air handling systems.
- visually identify types of air handling systems
  - explain dual duct and multi-zone systems
  - explain terminal reheat systems
  - explain 100% air make-up systems
  - explain constant volume-variable temperature systems
  - explain variable volume systems
  - explain induction systems
- 2.1.18 Identify and describe types of air filter systems.
- describe types of filters based on material and efficiency of filtration
  - perform test on building air
  - explain types of filter media commonly used in buildings
- 2.1.19 Identify and describe types of coils found in air handling systems.
- identify coils such as chilled water, hot water, glycol, direct expansion
- 2.1.20 Maintain finned coils found in ventilation systems.
- identify and use solvents and chemical cleaners
  - clean and brush finned coils
  - ensure safety is observed while using and disposing of solvents and cleaners
- 2.1.21 Identify and describe types of humidification systems.
- identify and describe heated pan type, steam grid, air washer and wetted element type humidification systems
  - explain relative humidity, and the need for humidification in building

- 2.1.22 Maintain and replace components of humidifiers.
- clean and lubricate humidification system components
  - adjust float on pan type humidifiers
  - perform preventative maintenance requirements
- 2.1.23 Identify and describe types of fan systems.
- identify centrifugal and axial types, blade design, components of fan systems such as pulleys, belts, guards, blades, bearings and housings
- 2.1.24 Select, replace and adjust tension on belts used on fan systems.
- adjust misaligned pulleys using procedure to level and align components
  - adjust belt tension according to manufacturers' specifications
  - replace worn belts and align pulleys
  - check fans for being level
- 2.1.25 Inspect fan and motor bearings.
- check fan and motor bearings manually and using a temperature measuring device
  - check for excessive vibrations, noise and abnormal temperature
  - issue work order for defective bearing
- 2.1.26 Identify and correct deficiencies and balance fan.
- interpret vibration analysis report on fan
  - assist Balance Technician in performing a static or dynamic balance

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimal Equipment List:**

Ductwork, dampers, filters, coils, humidifiers, distribution systems, exhaust systems, fans, mixing boxes, control devices.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	25%	100%

Number:	2.2		
Title:	<b>Air Conditioning</b>		
Duration:	Total Hours: 42	Theory: 28	Practical: 14
Prerequisites:	1.1, 1.2, 1.3, 1.7		
Co-requisites:	None		
Cross Reference to Training Standards:	5078.02 to 5078.06, 5078.08		

## General Learning Outcomes

Upon successful completion of the reportable subject, the apprentice is able to inspect and maintain air conditioning systems by accessing information; reading and interpreting blueprints and schematics; opening and unsealing window/wall units; maintaining system; monitoring and recording gauge readings; inspecting, cleaning, and winterizing coolant towers; adjusting and monitoring chemical feed pumps; checking for refrigerant leakage; closing in and sealing window or wall units; and preparing and assisting in startup and shutdown procedures.

## Learning Outcomes

Upon successful completion, the apprentice is able to:

- 2.2.1 Identify and describe utilization of air conditioning in building and facilities.
- 2.2.2 Determine refrigeration and air conditioning capacities.
- 2.2.3 Identify and explain the theory of operation of types of air conditioning and refrigeration systems.
- 2.2.4 Describe refrigeration theory from the basic compression refrigeration cycle model.
- 2.2.5 Identify and explain the operation of types of compressors used in refrigeration systems.
- 2.2.6 Install/remove window or sleeve air conditioning unit.
- 2.2.7 Maintain air conditioning unit.
- 2.2.8 Monitor air conditioning data.
- 2.2.9 Identify and describe components of commercial/industrial air conditioning systems.

- 2.2.10 Maintain, repair or replace defective components of air conditioning systems.
- 2.2.11 Identify and explain theory of operation of cooling towers.
- 2.2.12 Inspect, maintain and replace components of cooling tower.
- 2.2.13 Test for refrigerant leaks.
- 2.2.14 Perform preventative maintenance on air conditioning systems.

### **Learning Content**

- 2.2.1 Identify and describe utilization of air conditioning in building and facilities.
  - state the need for building air conditioning
  - state the need for refrigeration components in building air conditioning
- 2.2.2 Determine refrigeration and air conditioning capacities.
  - given data, calculate heating and cooling loads
  - perform a heating/cooling load survey
- 2.2.3 Identify and explain the theory of operation of types of air conditioning and refrigeration systems.
  - describe unitary, central, zone, heat pump system, chilled water systems
  - describe the components needed to make the air conditioning or refrigeration system functional
- 2.2.4 Describe refrigeration theory from the basic compression refrigeration cycle model.
  - identify and describe basic components of refrigeration systems
  - describe the interrelationship of components and the effect each has on the other
  - show temperatures and pressures for each part of the refrigeration process
- 2.2.5 Identify and explain the operation of types of compressors used in refrigeration systems.
  - explain reciprocating, rotary, screw, scroll and centrifugal compressors
  - describe refrigeration compressors commonly used in commercial applications

- 2.2.6 Install/remove window or sleeve air conditioning unit.
- use lifting techniques to place window air conditioner in position
  - seal around unit and opening with caulking and sealant
  - ensure operation by running unit for a period of time
  - check for abnormal operation and noises
  - describe unusual noises that may occur when machine is not functioning properly
  - utilize electrical lock-out procedure when performing unit shutdown
  - seal up opening with wood or metal
  - cut wood/metal to opening size, place in position, seal with a sealer
- 2.2.7 Maintain air conditioning unit.
- describe preventative maintenance procedures that may be required before storing for winter
  - remove cover from window unit and clean surfaces including condenser and evaporator coils
  - lubricate fan bearings
  - clean drain pan and tubing
  - tag and store unit
- 2.2.8 Monitor air conditioning data.
- observe and record in log sheets air conditioning data such as temperatures, pressures, refrigerant levels, oil levels, alarms, indicating lights and other related information
  - compare to manufacturers' specifications
  - describe safety devices found on air conditioning system
- 2.2.9 Identify and describe components of commercial/industrial air conditioning systems.
- describe strainers, nozzles, belts, dampers, filters, linkages, actuators and pans
  - describe major differences between commercial air conditioning and residential air conditioning systems
  - identify types of filters and dampers used in commercial/industrial air conditioning systems
- 2.2.10 Maintain, repair or replace defective components of air conditioning systems.
- access data from manufacturers' specifications and repair manuals
  - clean and lubricate components
  - complete work order for defects or deficiencies found in system
  - coordinate repairs that cannot be done in-house with contractor or trades person

- 2.2.11 Identify and explain theory of operation of cooling towers.
- describe types of tower and components such as fans, float valves, grating, nozzles, spargers, temperature sensors and baffle style water spray eliminators
  - describe layout of cooling towers commonly used in buildings
- 2.2.12 Inspect, maintain and replace components of cooling tower.
- check bearings and fan belt
  - record defects
  - issue work orders for work to be done by outside trades person
  - clean and winterized tower
  - remove and clean strainer
  - replace components
  - re-pack bearings
- 2.2.13 Test for refrigerant leaks.
- use testing procedures
  - use soap and water, litmus test or a halide torch
  - record findings
  - issue work orders for any repairs
  - coordinate with contractor or trades person to effect repairs of leaking air conditioning equipment
  - perform minor maintenance of refrigeration system
- 2.2.14 Perform preventative maintenance on air conditioning systems.
- identify and describe preventative or annual maintenance requirements for air conditioning equipment such as rooftop units, heat pumps, chillers, cooling towers, condensers, evaporators, pumps and related equipment
  - coordinate with contractor or trade person to perform scheduled maintenance
  - use lock-out/tag-out procedure (electrical and mechanical) to prepare air conditioning equipment for major repairs
  - using tools, isolate components and shut systems down as per manufacturers' procedures
  - access manuals, order the required parts prior to work commencing



**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimal Equipment List:**

Reciprocating, self contained, centrifugal heat pump, stand alone air conditioning units.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	25%	100%

Number:	2.3		
Title:	<b>Protection and Controls</b>		
Duration:	Total Hours: 18	Theory: 15	Practical: 3
Prerequisites:	1.1, 1.2, 1.3, 1.6, 1.7		
Co-requisites:	None		
Cross Reference to Training Standards:	5077.01, 5077.02, 5077.04, 5087.01, 5087.02		

### General Learning Outcomes

Upon successful completion of the reportable subject, the apprentice is able to test safety devices found on low pressure heating boilers; maintain temperatures on heating systems; test, adjust, calibrate, repair, and replace thermostats; explain the functioning of pneumatic controls and valves, electric and electronic controls; inspect damper motors and actuators; describe hydrometers, bourdon tubes, thermocouples, IC sensors, thermistors; adjust automatic fill valves, test low water cut-out, verify function of high temperature limit switches; test and adjust pressure actuated switches, differential pressure switches, and temperature actuated switches.

### Learning Outcomes

Upon successful completion, the apprentice is able to:

- 2.3.1 Explain the types and functions of thermostats.
- 2.3.2 Adjust set-points on thermostats and aquastats.
- 2.3.3 Identify, describe and test safety devices found on low pressure heating boilers according to manufacturers' specifications.
- 2.3.4 Describe basic ignition control systems such as hot surface ignition, pilot flame system and spark ignition.
- 2.3.5 Identify and describe types of controls used to maintain temperatures on heating systems.
- 2.3.6 Adjust, test, calibrate thermostats to set standards according to manufacturers' specifications and repair manuals.
- 2.3.7 Repair and replace thermostats according to manufacturers' specifications and repair manuals.

- 2.3.8 Explain the functioning of pneumatic controls and valves, electric and electronic controls.
- 2.3.9 Inspect the operation of damper motors and actuators.
- 2.3.10 Explain the function of hydrometers, bourdon tubes, thermocouples, IC sensors, and thermistors.
- 2.3.11 Describe the function and maintenance of automatic fill valves, low water cut-out, and high temperature limit switches and adjust automatic fill valve pressure setting, perform a low water cut-out test, and verify function of high temperature limit device.
- 2.3.12 Test and adjust pressure actuated switches, differential pressure switches and temperature actuated switches.

### **Learning Content**

- 2.3.1 Explain the types and functions of thermostats.
- identify types of thermostats such as bi-metallic, pneumatic, electronic
  - explain the operation of thermostats
- 2.3.2 Adjust set-points on thermostats and aquastats.
- verify settings on thermostats and aquastats
  - compare and record aquastat reading to actual temperature
  - record in daily log book any changes made
- 2.3.3 Identify, describe and test safety devices found on low pressure heating boilers according to manufacturers' specifications.
- identify low water cut-off, safety relief valve, safety pop valve, gauge glass, water column, low gas pressure cut-out, high water cut-out, low air flow switch, and burner flame failure
  - test and record in logbook according to manufacturers' specifications
- 2.3.4 Describe basic ignition control systems such as hot surface ignition, pilot flame system and spark ignition.
- outline types of ignition control systems such as hot surface, pilot system and spark ignition
  - explain operating conditions and features of each system
- 2.3.5 Identify and describe types of controls used to maintain temperatures on heating systems.
- identify pneumatic, electrical, and electronic controls

- 2.3.6 Adjust, test, calibrate thermostats to set standards according to manufacturers' specifications and repair manuals.
- adjust thermostat temperature setting
  - calibrate pneumatic thermostats
  - compare thermostat settings within manufacturers' specifications
- 2.3.7 Repair and replace thermostats according to manufacturers' specifications and repair manuals.
- 2.3.8 Explain the functioning of pneumatic controls and valves, electric and electronic controls.
- describe how air pressure is used to operate pneumatic controls and valves
  - explain a modulating electric motor
  - identify voltages used in electric and electronic systems
- 2.3.9 Inspect the operation of damper motors and actuators.
- measure, using the air pressure exerted on the diaphragm
  - visually identify movement of damper actuator arm
- 2.3.10 Explain the function of hydrometers, bourdon tubes, thermocouples, IC sensors, and thermistors.
- demonstrate the operation of a hydrometer
  - identify types of thermocouples
  - explain the theory of operation of thermocouple junctions
  - identify and describe the operation of a bourdon tube as a pressure sensing device
  - describe the resistance characteristics of thermistors
- 2.3.11 Describe the function and maintenance of automatic fill valves, low water cut-out, and high temperature limit switches and adjust automatic fill valve pressure setting, perform a low water cut-out test, and verify function of high temperature limit device.
- identify automatic fill valves, low water cut-out and high temperature limit switches
  - test low water cut-out by draining water
- 2.3.12 Test and adjust pressure actuated switches, differential pressure switches and temperature actuated switches.
- explain the theory of operation of a pressure actuated, differential pressure and temperature actuated switch

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimal Equipment List:**

Low pressure boiler, thermocouples, hydrometer, fill valves, thermistors, aquastats. Bi-metallic, pneumatic, electric, electronic thermostats. Temperature and pressure actuated switches.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
80%	20%	100%

Number:	2.4		
Title:	<b>Heating</b>		
Duration:	Total Hours: 42	Theory: 28	Practical: 14
Prerequisites:	1.1, 1.2, 1.3, 1.7		
Co-requisites:	None		
Cross Reference to Training Standards:	5077.0, 5087.01, 5087.02		

### General Learning Outcomes

Upon successful completion of the reportable subject, the apprentice is able to inspect, maintain and troubleshoot heating systems by accessing information, reading and interpreting blueprints and schematics, monitoring and recording gauge readings, checking system and related components, maintaining controls and thermostats, checking and maintaining pumps and motors, and preparing for on-site inspections.

### Learning Outcomes

Upon successful completion, the apprentice is able to:

- 2.4.1 Identify and explain types of heating systems.
- 2.4.2 Identify and describe components of heating systems.
- 2.4.3 Identify layout and location of piping and ductwork associated with heating systems and components of heating systems.
- 2.4.4 Record data such as temperatures, pressures, levels, flows, alarms, indicating lights, status, on log sheets, and compare with manufactures' specifications and normal operating procedures.
- 2.4.5 Adjust set-points on thermostats and aquastats of boiler and heating systems.
- 2.4.6 Visually inspect components of boilers, heating systems and furnaces.
- 2.4.7 Identify and describe requirements for testing water quality for boilers and heating systems and perform and interpret water tests.
- 2.4.8 Adjust chemical and treatment requirements of water quality for boilers and heating systems.
- 2.4.9 Identify and describe safety devices found on low pressure heating boilers.

- 2.4.10 Test safety devices on low pressure heating boilers according to manufacturers' specifications.
- 2.4.11 Identify and describe types of pumps used in heating systems.
- 2.4.12 Identify and describe the types of controls and thermostats used to maintain temperatures on heating systems.
- 2.4.13 Adjust, test, calibrate thermostats to set standards, using manufacturers' specifications and repair manuals.
- 2.4.14 Repair or replace thermostat.
- 2.4.15 Inspect pump and motor.
- 2.4.16 Select and replace pump packing in centrifugal pumps and check mechanical seals.
- 2.4.17 Maintain heating system pumps.
- 2.4.18 Test piping and tubing systems so that leaks are identified and documented.
- 2.4.19 Purge piping and tubing systems using tools and equipment.
- 2.4.20 Protect piping and tubing systems from corrosion.
- 2.4.21 Describe the requirement to convert an appliance from propane to natural gas.

### **Learning Content**

- 2.4.1 Identify and explain types of heating systems.
  - identify heating systems such as steam, hot water, forced warm air, and electric
  - explain the mechanic's responsibility on each type of heating system
- 2.4.2 Identify and describe components of heating systems.
  - describe components such as steam boilers, hot water boilers, convectors, radiators, circulating pumps, expansion tanks, blowers, electric baseboard heaters, furnaces
- 2.4.3 Identify layout and location of piping and ductwork associated with heating systems and components of heating systems.
  - locate system components from blueprints and related items from applicable schematic
  - identify shut-off valves, dampers, control valves, thermostats, controllers and other auxiliary components of heating system

- 2.4.4 Record data such as temperatures, pressures, levels, flows, alarms, indicating lights, status, on log sheets, and compare with manufactures' specifications and normal operating procedures.
- accurately read and interpret gauge readings pertaining to pressure, flow or level
  - identify abnormal situations referencing equipment manual
- 2.4.5 Adjust set-points on thermostats and aquastats of boiler and heating systems.
- record in daily log book any changes made
  - describe the procedure to adjust set points on thermostats and aquastats
- 2.4.6 Visually inspect components of boilers, heating systems and furnaces.
- assist in opening of boiler for inspection purposes
  - perform a safety inspection on a heating boiler
  - inspect and record abnormal situations and defects
  - issue work orders for any repairs or deficiencies found by inspector
- 2.4.7 Identify and describe requirements for testing water quality for boilers and heating systems and perform and interpret water tests.
- demonstrate procedure for water testing of heating system and boiler according to treatment company guidelines
  - record results of water test in log book
- 2.4.8 Adjust chemical and treatment requirements of water quality for boilers and heating systems.
- interpret test results
  - calculate type and amount of chemicals needed
- 2.4.9 Identify and describe safety devices found on low pressure heating boilers.
- describe safety devices such as low water cut-off, safety relief valve, safety pop valve, gauge glass, water column, low gas pressure cut-out, high water cut-out, low air flow switch, and burner flame failure
- 2.4.10 Test safety devices on low pressure heating boilers according to manufacturers' specifications.
- test safety devices as per schedule and record results of test
  - perform duties as stated in the preventative maintenance schedule
- 2.4.11 Identify and describe types of pumps used in heating systems.
- describe pumps such as positive displacement, centrifugal, and rotary types
  - locate pumps in heating systems
  - describe the uses for positive displacement, centrifugal, and rotary pumps



- 2.4.12 Identify and describe the types of controls and thermostats used to maintain temperatures on heating systems.
- explain how heating controls function for heating system operation
- 2.4.13 Adjust, test, calibrate thermostats to set standards, using manufacturers' specifications and repair manuals.
- calibrate pneumatic thermostat using approved procedures and according to manufacturers' specifications
- 2.4.14 Repair or replace thermostat.
- use required replacement parts
  - describe procedure for replacing pneumatic and electric thermostats
- 2.4.15 Inspect pump and motor.
- check for leakage, vibration, bearing noise, abnormal temperature and flow
  - use inspection procedures to check pumps and motors
- 2.4.16 Select and replace pump packing in centrifugal pumps and check mechanical seals.
- visually inspect mechanical seal for leakage
  - replace following manufacturers' guidelines
  - issue work order if seal is leaking
- 2.4.17 Maintain heating system pumps.
- clean, lubricate heating system pumps
  - change oil
  - align heating system pumps
  - clean strainers throughout the heating systems
  - test safety relief valve on pump
- 2.4.18 Test piping and tubing systems so that leaks are identified and documented.
- perform leak detection using dial test, pressure test, manometer test and soap test
  - describe difference between test methods on natural gas and propane
  - document test results on test tag
- 2.4.19 Purge piping and tubing systems using tools and equipment.
- purge piping and tubing systems for natural gas and propane
  - refer to code requirements for purging to outdoors using a purge burner
  - purge appliances using an explosive meter
  - outline supervisory regulations for purging systems

- 2.4.20 Protect piping and tubing systems from corrosion.
- explain methods for protecting piping and tubing materials, joints and fittings
  - describe reasons for corrosion protection such as electrolytic action, corrosive materials
  - select types of protective coating methods, wrapping, painting, sealants and sleeving
- 2.4.21 Describe the requirement to convert an appliance from propane to natural gas.
- recognize the appliance is dual fuel and describe requirements from the utilization codes
  - discuss appliance after conversion in terms of clock input, burner adjustment, venting action, gas pressure requirements and piping practices

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimal Equipment List:**

Steam boiler, hot water boiler, convectors, radiators, circulating pumps, expansion tanks, blowers, electric baseboard heaters, electric forced air furnace, unit heaters, radiators.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	25%	100%

Number:	2.5		
Title:	<b>Water Systems</b>		
Duration:	Total Hours: 24	Theory: 16	Practical: 8
Prerequisites:	1.1, 1.2, 1.3, 1.4, 1.7		
Co-requisites:	None		
Cross Reference to Training Standards:	5080.0		

### General Learning Outcomes

Upon successful completion of the reportable subject, the apprentice is able to inspect and maintain water treatment systems by accessing information; reading and interpreting blueprints and schematics; identifying, monitoring, and maintaining chemical balance of water system; and checking and maintaining components of water treatment systems. The apprentice is also able to operate, monitor and maintain domestic water treatment systems and heating and cooling water systems.

### Learning Outcomes

Upon successful completion, the apprentice is able to:

- 2.5.1 Identify principal contaminants in water and explain how removal or treatment can provide desired benefits.
- 2.5.2 Accessing information, identify types of treatment processes.
- 2.5.3 Identify layout and location of water treatment systems.
- 2.5.4 Identify and describe standard water tests.
- 2.5.5 Perform water tests following water treatment company guidelines.
- 2.5.6 Using safe procedures, add water treatment chemicals to a closed loop system.
- 2.5.7 Adjust, calibrate and set chemical injection rates, using chemical pumps.
- 2.5.8 Record test data, pump injection rates, chemical inventory and other information.
- 2.5.9 Clean or replace filters in closed loop systems and clean strainers on open loop systems.

- 2.5.10 Identify and describe water treatment needs for heating systems, chilled water systems, cooling towers, closed loop coolers, humidification systems, pools and spas.
- 2.5.11 Collect water samples according to accepted laboratory standards from sampling points, and test, record and interpret results of tests.
- 2.5.12 Add water treatment chemicals, adjust chemical pump feed rates, using test results.
- 2.5.13 Implement environmental regulations regarding chemical disposal.
- 2.5.14 Maintain Material Safety Data System (MSDS) information in close proximity to chemical storage and chemical addition equipment, and update WHMIS information and labels and affix to containers.
- 2.5.15 Maintain safety equipment specific to chemical handling and storage.
- 2.5.16 Clean and store safety eye wash bottles, fountains and safety showers.

### **Learning Content**

- 2.5.1 Identify principal contaminants in water and explain how removal or treatment can provide desired benefits.
  - state the types of water contaminants normally found in domestic water
- 2.5.2 Accessing information, identify types of treatment processes.
  - identify types of water filters and softener used
  - describe the types of water treatment processes used in buildings for heating and cooling operations
- 2.5.3 Identify layout and location of water treatment systems.
  - identify layout and location of water softeners, closed loop systems, filtration systems, de-aerators, pot feeders, chemical tanks, and injection pumps
  - read and interpret blueprints
- 2.5.4 Identify and describe standard water tests.
  - describe Total Dissolved Solids (TDS), Hardness Test, pH test, Chlorine Residual test
- 2.5.5 Perform water tests following water treatment company guidelines.

- 2.5.6 Using safe procedures, add water treatment chemicals to a closed loop system.
- add chemicals using a pot feeder
  - select and safely handle water treatment chemicals according to suppliers and OHSA guidelines
- 2.5.7 Adjust, calibrate and set chemical injection rates, using chemical pumps.
- adjust timer to ensure interval for chemical injection
  - set and adjust timers and controls on chemical feeders to provide the required dosage, according to specifications
- 2.5.8 Record test data, pump injection rates, chemical inventory and other information.
- record in log book
  - perform required water purity tests
- 2.5.9 Clean or replace filters in closed loop systems and clean strainers on open loop systems.
- select and replace filters/strainers, using tools
- 2.5.10 Identify and describe water treatment needs for heating systems, chilled water systems, cooling towers, closed loop coolers, humidification systems, pools and spas.
- describe water treatment needs for steam heating, hot water heating, domestic water systems, chilled water, cooling towers, closed loop systems, air humidification, swimming pools and spas
- 2.5.11 Collect water samples according to accepted laboratory standards from sampling points, and test, record and interpret results of tests.
- test Chlorine level, Ph level, Iron and sulphur, Hardness, “P” Alkalinity, “M” alkalinity, Total Dissolved solids, Conductivity
  - demonstrate water testing techniques
  - perform water treatment tests as per water treatment chemical company standards
- 2.5.12 Add water treatment chemicals, adjust chemical pump feed rates, using test results.
- utilize test results and calculate amount and type of chemicals needed for system
- 2.5.13 Implement environmental regulations regarding chemical disposal.
- ensure ventilation according to WHMIS regulations
  - demonstrate disposal procedure

- 2.5.14 Maintain Material Safety Data System (MSDS) information in close proximity to chemical storage and chemical addition equipment, and update WHMIS information and labels and affix to containers.
- update log book
  - contact chemical company for information
- 2.5.15 Maintain safety equipment specific to chemical handling and storage.
- store masks, goggles, aprons, rubber gloves
  - determine when more stock or replacement is needed
  - demonstrate use of water treatment chemicals safety equipment such as masks, goggles, aprons and rubber gloves
- 2.5.16 Clean and store safety eye wash bottles, fountains and safety showers.
- describe the eyewash and eye wash fountain requirements
  - demonstrate use of eye washes and fountains
  - ensure hygienic conditions for eye wash stations

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimal Equipment List:**

Timers, chemical feed pumps and associated control hardware, MSDS information, WHMIS information, water testing equipment.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	25%	100%

Number:	2.6		
Title:	<b>Facilities Maintenance 2</b>		
Duration:	Total Hours: 42	Theory: 21	Practical: 21
Prerequisites:	1.1, 1.2, 1.3, 1.5, 1.7		
Co-requisites:	None		
Cross Reference to Training Standards:	5071.01, 5071.02, 5073.0, 5083.0		

## General Learning Outcomes

Upon successful completion of the reportable subject, the apprentice is able to inspect, test, adjust, repair or replace entry and exit systems and associated hardware; change hardware and software codes for electronic entry systems. The apprentice is able to inspect inside and outside of roof, eaves, and downspouts; perform minor roof repairs; perform preventative and predictive maintenance procedures by accessing information; reading and interpreting blueprints, shop drawings, and schematics; analyzing, planning, preparing and performing preventative maintenance duties; and coordinating outside contractors for inspections and corrective work.

## Learning Outcomes

Upon successful completion, the apprentice is able to:

- 2.6.1 Identify and describe types of roofs.
- 2.6.2 Interpret roofing blueprints and drawings, type of construction, location of drawings and access information from Ontario Building Code Municipal bylaws and manufacturers' specifications.
- 2.6.3 Inspect roof visually.
- 2.6.4 Apply sealants, caulking or patching compounds to roof.
- 2.6.5 Identify and describe door hardware.
- 2.6.6 Describe the procedure to install a new passage set, key lock, deadbolt and verify operation.
- 2.6.7 Identify types of door closers used for commercial doors.
- 2.6.8 Adjust a door closer.
- 2.6.9 Replace hinges on doors.

- 2.6.10 Describe electronic entry systems and enter software or hardware programming codes.
- 2.6.11 Create preventative maintenance schedules in compliance with required standards.
- 2.6.12 Complete work orders for scheduled preventative maintenance work on equipment under mechanic's care.
- 2.6.13 Determine in-house trade/maintenance limitations and outside trade or contract requirements for scheduled maintenance on equipment.
- 2.6.14 Interpret blueprints, shop drawings and schematics for location and layout of equipment listed in the preventative maintenance schedule.
- 2.6.15 Prepare and/or update building equipment survey, parts list, manufacturers' locations, parts availability, manufacturers' specifications for preventative maintenance equipment.
- 2.6.16 Prepare and update preventative maintenance inspection routines, monthly work orders, log sheets, specialized tests and check lists for equipment.
- 2.6.17 Schedule dates, times and frequency for performing preventative maintenance work.
- 2.6.18 Perform cost analysis of work performed.
- 2.6.19 Perform scheduled preventative maintenance within limitations set by company standards or license/certification requirements.
- 2.6.20 Obtain permits, certificates or specialized requirement for work to be performed and complete forms for inspection certificates, warranties and government regulations.
- 2.6.21 Check that outside trades people and contractors follow safety regulations.
- 2.6.22 Inspect work done by in-house staff and outside trades people and contractors.

### **Learning Content**

- 2.6.1 Identify and describe types of roofs.
  - list roof types by slope
  - list roof types by material



- 2.6.2 Interpret roofing blueprints and drawings, type of construction, location of drawings and access information from Ontario Building Code Municipal bylaws and manufacturers' specifications.
- read drawings to determine roof details
  - access information from Ontario building code in regards to roofs
- 2.6.3 Inspect roof visually.
- identify signs of deterioration, visible defects, damaged flashing, ripped shingles, ponding of water, plugged roof drains
- 2.6.4 Apply sealants, caulking or patching compounds to roof.
- select required sealants, caulking or patching compounds
- 2.6.5 Identify and describe door hardware.
- describe passage sets, key locks, dead bolts, panic bars, hinges, door closers and door stops.
  - outline theory of operation of panic bar
  - identify types of hinges used on doors
- 2.6.6 Describe the procedure to install a new passage set, key lock, deadbolt and verify operation.
- measure using template location of passage set and deadbolt
  - align both sides of passage set and dead bolt and fasten to door
  - check operation of passage set and deadbolt
- 2.6.7 Identify types of door closers used for commercial doors.
- describe theory of operation of door closers
  - identify installation location of door closer
- 2.6.8 Adjust a door closer.
- adjust door closer for closing and latch speed
  - adjust door closer for backlash
- 2.6.9 Replace hinges on doors.
- select hinges
- 2.6.10 Describe electronic entry systems and enter software or hardware programming codes.
- describe theory of operation of electronic entry systems
  - identify types of electronic entry systems by hardware
  - explain how software is used to control entry systems
  - change access cards and entry codes according to manufacturers' specifications
  - change hardware codes by inserting jumper pins or changing settings

- 2.6.11 Create preventative maintenance schedules in compliance with required standards.
- access information from the Ontario Building code, company operating procedures manual, manufacturers' specifications and warranties, work order file system and equipment
- 2.6.12 Complete work orders for scheduled preventative maintenance work on equipment under mechanic's care.
- prepare work orders from information gathered from building equipment data base
- 2.6.13 Determine in-house trade/maintenance limitations and outside trade or contract requirements for scheduled maintenance on equipment.
- list in-house trade/maintenance requirements, outside contractor or trades person requirements
- 2.6.14 Interpret blueprints, shop drawings and schematics for location and layout of equipment listed in the preventative maintenance schedule.
- physically locate equipment and systems listed in the preventative maintenance schedule using blueprints and shop drawings
- 2.6.15 Prepare and/or update building equipment survey, parts list, manufacturers' locations, parts availability, manufacturers' specifications for preventative maintenance equipment.
- identify parts by number and type
- 2.6.16 Prepare and update preventative maintenance inspection routines, monthly work orders, log sheets, specialized tests and check lists for equipment.
- add, remove, change inspection routines for preventative maintenance program
  - describe documentation required for preventative maintenance program
  - prepare check lists and log sheets
- 2.6.17 Schedule dates, times and frequency for performing preventative maintenance work.
- 2.6.18 Perform cost analysis of work performed.
- 2.6.19 Perform scheduled preventative maintenance within limitations set by company standards or license/certification requirements.
- perform required checks
  - make adjustments/repairs where required

- 2.6.20 Obtain permits, certificates or specialized requirement for work to be performed and complete forms for inspection certificates, warranties and government regulations.
- 2.6.21 Check that outside trades people and contractors follow safety regulations.
- 2.6.22 Inspect work done by in-house staff and outside trades people and contractors.

**Instructional/Delivery Strategies:**

**Reference Materials:**

National Building Code, Ontario Building Code, operating and procedure manuals, blue prints, drawings and log sheets.

**Minimal Equipment List:**

Doors, windows, weather stripping, caulking, door hardware, irrigation equipment, playground equipment, safety barriers, required safety equipment, flashing, roofing materials, ladders, scaffolding, common hand tools, drafting tools.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	25%	100%

Number:	2.7		
Title:	<b>Appliances and Laundry Systems</b>		
Duration:	Total Hours: 30	Theory: 20	Practical: 10
Prerequisites:	1.1, 1.2, 1.3, 1.6, 1.7		
Co-requisites:	None		
Cross Reference to Training Standards:	5076.0, 5082.0		

## General Learning Outcomes

Upon successful completion of the reportable subject, the apprentice is able to inspect, maintain and troubleshoot domestic appliances by accessing information, reading and interpreting blueprints and schematics; inspecting and maintaining domestic electrical appliances; and setting up, leveling, and testing appliances. The apprentice is also able to inspect, maintain and troubleshoot laundry systems by accessing information; checking and testing safety devices; and inspecting and maintaining laundry system, components and parts.

## Learning Outcomes

Upon successful completion, the apprentice is able to:

- 2.7.1 Identify types of appliances, location of water supply and drainage, required electrical voltage and capacity, and ventilation requirements.
- 2.7.2 Determine voltage and amperage of appliance and ensure circuit breakers, fuses and wiring meets Codes and local bylaws.
- 2.7.3 Repair or replace defective components on domestic appliances following manufacturers' guidelines.
- 2.7.4 Maintain appliances according to manufacturers' specifications and preventative maintenance schedule.
- 2.7.5 Set up, level and test operation of appliance.
- 2.7.6 Install drain, overflow and back-flow prevention devices.
- 2.7.7 Identify and describe types of laundry systems and related components.
- 2.7.8 Identify and describe the function of safety devices for laundry systems.
- 2.7.9 Test and adjust safety devices for laundry systems using service manuals.

- 2.7.10 Maintain components of laundry systems.
- 2.7.11 Troubleshoot inoperative laundry systems.
- 2.7.12 Replace or repair defective parts of laundry systems.
- 2.7.13 Accessing information from the Ontario Building code, company operating and procedures manual, manufacturers' specifications and warranties, work order file system and equipment, create preventative maintenance schedules in compliance with required standards.
- 2.7.14 Interpret codes and acts that affect the utilization of propane and natural gas as pertains to fuel burning appliances.
- 2.7.15 Complete work orders for scheduled preventative maintenance work on appliances.
- 2.7.16 Determine in-house trade/maintenance limitations and outside trade or contract requirements for scheduled maintenance on appliances.
- 2.7.17 Interpret blueprints, shop drawings and schematics for location and layout of appliances listed in the preventative maintenance schedule.
- 2.7.18 Prepare and/or update building appliances survey, parts list, manufacturers' locations, parts availability, manufacturers' specifications for all preventative maintenance.
- 2.7.19 Prepare and update preventative maintenance inspection routines for appliances and laundry systems.
- 2.7.20 Schedule dates, times and frequency for performing preventative maintenance work.
- 2.7.21 Perform scheduled preventative maintenance that is within limitations set by company standards or license/certification requirements.

### **Learning Content**

- 2.7.1 Identify types of appliances, location of water supply and drainage, required electrical voltage and capacity, and ventilation requirements.
  - read and interpret blueprints to identify/locate appliances and their hook-ups for electricity, water and/or drains

- 2.7.2 Determine voltage and amperage of appliance and ensure circuit breakers, fuses and wiring meets Codes and local bylaws.
- visually inspect fuses, circuit breakers and wiring for wear and defects
  - using a multi meter, check voltage and amperage when troubleshooting appliances
- 2.7.3 Repair or replace defective components on domestic appliances following manufacturers' guidelines.
- identify and repair/replace power cords, belts, switches, controls, valves, timers, gaskets, seals, sensors, elements, indicator lights, and fuses on domestic appliances
- 2.7.4 Maintain appliances according to manufacturers' specifications and preventative maintenance schedule.
- using preventative maintenance schedule, determine when lubrication and cleaning of appliances is required
  - clean appliances
  - lubricate appliances
  - adjust appliances
- 2.7.5 Set up, level and test operation of appliance.
- utilizing manufacturers' specifications, connect appliance to power supply, water source, drain and vent
  - start up appliance, perform tests
- 2.7.6 Install drain, overflow and back-flow prevention devices.
- select correct size and capacity of drain
  - prevent siphoning of waste water into domestic supply
- 2.7.7 Identify and describe types of laundry systems and related components.
- describe pumps, filters, drums, transmissions and safety devices
- 2.7.8 Identify and describe the function of safety devices for laundry systems.
- describe the function and location of limit switches, cut-out switch, overloads, float and flow switches
- 2.7.9 Test and adjust safety devices for laundry systems using service manuals.
- test and adjust limit, float, flow, and cut-out switches
- 2.7.10 Maintain components of laundry systems.
- clean belts, vents, drains, filters, control knobs and worn bearings
  - lubricate components of laundry system

- 2.7.11 Troubleshoot inoperative laundry systems.
- check controls, power source, fuses, limit switches, and other devices inspect
  - log abnormal situations
  - check for suspected problems using tools and diagnostic equipment
  - using lock out/tag out procedure, isolate inoperative laundry system
  - coordinate contractors or trades for major repair
- 2.7.12 Replace or repair defective parts of laundry systems.
- order replacement parts for the appliance
  - issue work orders for major repair
  - coordinate contractor or trades person to effect repairs
- 2.7.13 Accessing information from the Ontario Building code, company operating and procedures manual, manufacturers' specifications and warranties, work order file system and equipment, create preventative maintenance schedules in compliance with required standards.
- 2.7.14 Interpret codes and acts that affect the utilization of propane and natural gas as pertains to fuel burning appliances.
- apply knowledge of codes and regulations to ensure personal a public safety
  - reference, Ontario Propane Gas Utilization Code, Ontario Natural Gas Utilization Code, Technical Standards and Safety Act (Fuels Safety Regulation), CAN/CSA – Z240 Mobile homes, CAN/CSA – Z241 Park Model Trailers
  - locate sections from the codes as they apply to clearance for combustibles, and propane storage and handling
  - perform tasks using the Utilization codes to size venting systems, size piping systems, size ventilation systems
- 2.7.15 Complete work orders for scheduled preventative maintenance work on appliances.
- prepare work orders from information from building equipment data base
- 2.7.16 Determine in-house trade/maintenance limitations and outside trade or contract requirements for scheduled maintenance on appliances.
- list in-house trade/maintenance requirements and outside contractor or trades person requirements for preventative maintenance
- 2.7.17 Interpret blueprints, shop drawings and schematics for location and layout of appliances listed in the preventative maintenance schedule.
- physically locate equipment and systems listed in the preventative maintenance schedule using blueprints and shop drawings

- 2.7.18 Prepare and/or update building appliances survey, parts list, manufacturers' locations, parts availability, manufacturers' specifications for all preventative maintenance.
- complete a building appliance survey used in preparing preventative maintenance schedules
  - identify parts by number and type
- 2.7.19 Prepare and update preventative maintenance inspection routines for appliances and laundry systems.
- prepare and update (add, remove, change) monthly work orders, log sheets, specialized tests and check lists
  - describe documentation required for preventative maintenance program
- 2.7.20 Schedule dates, times and frequency for performing preventative maintenance work.
- 2.7.21 Perform scheduled preventative maintenance that is within limitations set by company standards or license/certification requirements.
- perform required checks
  - make adjustments/repairs where required

**Instructional/Delivery Strategies:**

**Reference Materials:**

**Minimal Equipment List:**

Washers, dryers, ranges, diverters, common hand tools, electric hot water tanks, vacuum systems, electrical test equipment.

Evaluation Structure		
Theory Testing	Practical Application Testing	Final Assessment
75%	25%	100%



## APPENDIX A: Acronyms List

AC	Alternating Current
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
CEC	Canadian Electrical Code
CSA	Canadian Standards Association
DC	Direct Current
DDC	Distributed Digital Control
DWV	Drain Waste Vent
ESA	Electrical Safety Authority
H <sub>2</sub> O	Water
IC	Integrated Circuit
MSDS	Material Safety Data Sheet
NBC	National Building Code
NFPA	National Fire Protection Act OBC Ontario Building Code
OBC	Ontario Building Code
OHSA	Occupational Health and Safety Act
PVC	Polyvinyl Chloride
SAE	Society of Automotive Engineers
TDS	Total Dissolved Solids
TSSA	Technical Standards and Safety Authority
WHMIS	Workplace Hazardous Material Information System
WSIB	Workplace Safety and Insurance Board



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