SKILLED TRADES BC

PROGRAM OUTLINE

Appliance Service Technician

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SKILLED TRADES BC

APPLIANCE SERVICE TECHNICIAN
PROGRAM OUTLINE

APPROVED BY INDUSTRY

JANUARY 2012

BASED ON

2006 NATIONAL OCCUPATIONAL ANALYSIS (NOA)

Developed by
SkilledTradesBC
Province of British Columbia

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Section 1

INTRODUCTION

Appliance Service Technician

Foreword

The revised Appliance Service Technician Program Outline is intended as a guide for instructors, apprentices, and employers of apprentices, as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the National Occupational Analysis for Appliance Service Technician and British Columbia industry and instructor subject matter experts.

Practical instruction by demonstration and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

The Program Outline was prepared with the advice and assistance of the Industry Steering Committee and will form the basis for further updates of the British Columbia Appliance Service Technician and creation of the learning resources by the Automotive Training Standards Organization on behalf of SkilledTradesBC.

Each competency is to be evaluated through the use of written and/or a practical assessment in which the learner must achieve a minimum of 70% in order to receive a passing grade for that competency. The types of questions used on these exams must reflect the cognitive level indicated by the learning objectives and the learning tasks listed in the related competencies.

The performance spelled out in the Achievement Criteria is suggested performance and is not meant to stifle flexibility of delivery. Training providers are welcome to substitute other practical performances that measure similar skills and attainment of the competency. Multiple performances may also be used to replace individual performances where appropriate.

SAFETY ADVISORY

Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com). Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

Acknowledgements

The Program Outline was prepared with the advice and direction of an industry steering committee convened initially by the Automotive Training Standards Organization (ATSO). Members include:

Industry subject matter experts retained to assist in the development of Program Outline content:

- David Fengstad Appliance Servicing Instrutor/Coordinator Kwantlen Polytechnic University
- Thomas Westgate Appliance Servicing Instructor Kwantlen Polytechnic University

Industry subject matter experts retained as outline reviewers:

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- Glen Muir Appliance Division, Direct Energy- Operation Manager, Western Canada
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Facilitators:

- Lloyd Stamm CEO-ATSO
- Kevin Cudmore Program Development Coordinator-ATSO
- Lee Bouchard Assessment Coordinator-ATSO
- Taryn Wilson Administrative Assistant-ATSO

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Appliance Service Technician occupation.

How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
Program Assessment	Communicate program completion requirements and assessment methods	Understand the various assessment requirements for the program	Understand the various assessment requirements for the program	Understand the assessment requirements they would have to fulfill in order to challenge the program
OAC	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
Training Topics and Suggested Time Allocation	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the relative weightings of various competencies of the occupation on which assessment is based
Program Content	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measureable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Training Provider Standards	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment

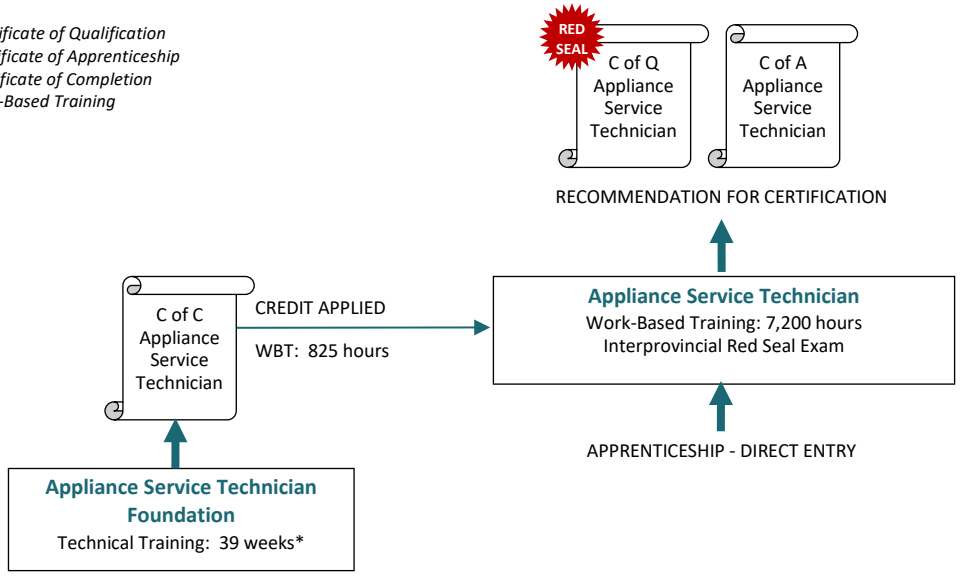
Section 2

PROGRAM OVERVIEW

Appliance Service Technician

Program Credentialing Model

C of Q = Certificate of Qualification
C of A = Certificate of Apprenticeship
C of C = Certificate of Completion
WBT = Work-Based Training



**Suggested duration based on 30-hour week*

CROSS-PROGRAM CREDITS
Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

None

Occupational Analysis Chart

APPLIANCE SERVICE TECHNICIAN

Occupation Description: Appliance Service Technicians identify appliance concerns by performing diagnostic procedures with testing equipment. Based on their assessment, they provide work and cost estimates to the customer. They may provide installation and maintenance services. They disassemble appliances, repair, remove and replace components, and reassemble appliances. They recover refrigerant gases and transfer the gases into approved storage containers for disposal according to jurisdictional regulations. Appliance Service Technicians may be called to demonstrate the use and care of the appliance to the customer.

OCCUPATIONAL SKILLS A	Describe safety in appliance servicing A1 F	Describe customer relations A2 F	Identify tools A3 F			
ELECTRICAL B	Describe electrical principles B1 F	Describe household wiring B2 F	Utilize electrical test equipment B3 F	Describe the laws of electromagnetism B4 F	Identify electric motors B5 F	Demonstrate troubleshooting with wiring schematics B6 F
ELECTRONICS C	Describe solid state components C1	Build power supplies and electrical filter systems C2 F	Describe sine wave and rectification C3 F			
ANCILLARY PRODUCTS D	Describe principles and operation of garbage disposals D1 F	Perform services on garbage disposals D2 F	Describe principles and operation of trash compactors D3 F	Perform services on trash compactors D4 F	Describe principles and operation of electric water heaters D5 F	Perform services on electric water heaters D6 F
ELECTRIC DRYERS E	Describe electric dryer installation E1	Service electric dryers E2 F	Perform electric dryer repairs E3 F			

Program Overview

ELECTRIC RANGES F	Describe electric range installation F1	Perform electric range services F2	Perform electric range repairs F3	
AUTOMATIC WASHERS G	Describe automatic washer installation G1	Service automatic washers G2	Repair automatic washers G3	
AUTOMATIC ELECTRIC DISHWASHERS H	Describe electric dishwasher installation H1	Service dishwashers H2	Diagnosis of wash cycles H3	
DOMESTIC REFRIGERATION AND AIRCONDITIONING I	Obtain CFC refrigerant certification I1	Describe refrigeration and air conditioning principles and installation I2	Service domestic refrigeration I3	Service domestic air conditioning I4
MICROWAVE TECHNOLOGIES J	Describe microwave installations J1	Perform microwave service J2	Perform microwave repairs J3	
BC PROVINCIAL "C" GAS CERTIFICATE K	Define the function of the Gas Safety Branch in BC K1	Define Gas Code/Regulations pertaining to permits, licence and inspections K2	Define safety practices of natural and propane gases K3	Apply regulations and safety practices K4
GAS APPLIANCES L	Describe the operation of gas pressure regulators L1	Describe atmospheric burner operation L2	Calculate venting requirements L3	Perform gas appliance services L4	Perform gas appliance repairs L5

Training Topics and Suggested Time Allocation

APPLIANCE SERVICE TECHNICIAN- FOUNDATION

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line A	**OCCUPATIONAL SKILLS**	**5%**	**70%**	**30%**	**100%**
A1	Describe safety in appliance servicing		✓		
A2	Describe customer relations		✓		
A3	Identify tools		✓	✓	
Line B	**ELECTRICAL**	**15%**	**70%**	**30%**	**100%**
B1	Describe electrical principles		✓		
B2	Describe household wiring		✓		
B3	Utilize electrical test equipment		✓	✓	
B4	Describe the laws of electromagnetism		✓		
B5	Identify electric motors		✓	✓	
B6	Demonstrate troubleshooting with wiring schematics		✓	✓	
Line C	**ELECTRONICS**	**10%**	**60%**	**40%**	**100%**
C1	Describe solid state components		✓		
C2	Build power supplies and electrical filter systems			✓	
C3	Describe sine wave and rectification		✓		
Line D	**ANCILLARY PRODUCTS**	**7%**	**50%**	**50%**	**100%**
D1	Describe principles and operation of garbage disposals		✓		
D2	Perform services on garbage disposals			✓	
D3	Describe principles and operation of trash compactors		✓		
D4	Perform services on trash compactors			✓	
D5	Describe principles and operation of electric water heaters		✓		
D6	Perform services on electric water heaters			✓	
Line E	**ELECTRIC DRYERS**	**8%**	**25%**	**75%**	**100%**
E1	Describe electric dryer installation		✓		
E2	Service electric dryers		✓	✓	
E3	Perform electric dryer repairs			✓	
Line F	**ELECTRIC RANGES**	**8%**	**20%**	**80%**	**100%**
F1	Describe electric range installation		✓		
F2	Perform electric range services		✓	✓	
F3	Perform electric range repairs			✓	
Line G	**AUTOMATIC WASHERS**	**10%**	**20%**	**80%**	**100%**
G1	Describe automatic washer installation		✓		
G2	Service automatic washers		✓	✓	
G3	Repair automatic washers			✓	
Line H	**AUTOMATIC ELECTRIC DISHWASHERS**	**5%**	**20%**	**80%**	**100%**

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
H1	Describe electric dishwasher installation		✓		
H2	Service dishwashers		✓	✓	
H3	Diagnosis of wash cycles			✓	
Line I	**DOMESTIC REFRIGERATION AND AIRCONDITIONING**	**15%**	**25%**	**75%**	**100%**
I1	Obtain CFC refrigerant certification		✓		
I2	Describe refrigeration and air conditioning principles and installation		✓		
I3	Service domestic refrigeration		✓	✓	
I4	Service domestic air conditioning			✓	
Line J	**MICROWAVE TECHNOLOGIES**	**5%**	**25%**	**75%**	**100%**
J1	Describe microwave installations		✓		
J2	Perform microwave service		✓	✓	
J3	Perform microwave repairs			✓	
Line K	**BC PROVINCIAL "C" GAS CERTIFICATE**	**5%**	**100%**	**0%**	**100%**
K1	Define the function of the Gas Safety Branch in BC		✓		
K2	Define Gas Code/Regulations pertaining to permits, licence and inspections		✓		
K3	Define safety practices of natural and propane gases		✓		
K4	Apply regulations and safety practices		✓		
LINE L	**GAS APPLIANCES**	**7%**	**25%**	**75%**	**100%**
L1	Describe the operation of gas pressure regulators		✓		
L2	Describe atmospheric burner operation		✓		
L3	Calculate venting requirements		✓		
L4	Perform gas appliance services			✓	
L5	Perform gas appliance repairs			✓	
	Total Percentage for Appliance Service Technician Foundation	**100%**			

Section 3

PROGRAM CONTENT

Appliance Service Technician

Foundation

Appliance Service Technician

Line (GAC): A OCCUPATIONAL SKILLS

Competency: A1 Describe safety in appliance servicing

Objectives

To be competent in this area, the individual must be able to:

- Describe workplace safety.
- Describe electrical safety.

LEARNING TASKS	CONTENT

1. Describe workplace safety	• Safety in the class
	  o Behaviour
	  o PPE (Personal Protective Equipment)
	• Safety in the shop
	  o Behaviour
	  o PPE
	  o Tools and equipment
	• Fire safety
	  o Class A,B,C and D fires and extinguisher types for each
	  o P.A.S.S.
	  ▪ Pull
	  ▪ Aim
	  ▪ Squeeze
	  ▪ Sweep
	  o Conditions
	  ▪ Fuel
	  ▪ Oxygen
	  ▪ Heat

2. Describe electrical safety	• Electrical safety and equipment
	  o PPE
	  o Instructor consultation
	  o Curcuit protected outlet
	  o Electical safe tools

Line (GAC): A OCCUPATIONAL SKILLS

Competency: A2 Describe customer relations

Objectives

To be competent in this area, the individual must be able to:

- Describe customer relations.

LEARNING TASKS	CONTENT
1. Describe customer relations	• Communicate courteously and effectively with customers o Effective listening o Sociable and personal ethics o Non-verbal cues o Diverse background and cultural differences o Recognizing problems and devising and implementing a plan of action for customers o Handling concerns or conflicts effectively with active listening

Line (GAC): A OCCUPATIONAL SKILLS

Competency: A3 Identify tools

Objectives

To be competent in this area, the individual must be able to:

- Identify basic tools.
- Identify power tools.
- Describe tool safety.

LEARNING TASKS	CONTENT

1. Identify basic tools	• Hand Tools
	  o Screw drivers
	  o Nut drivers
	  o Hammers
	  o Punches and chizzles
	  o Plyers
	  o Hack saw
	  o Files
	  o Levels
	• Maintenance and Storage

2. Identify power tools	• Power tools
	  o Drill
	  o Grinder
	  o Cordless tools
	  ▪ Screw drivers
	  ▪ Drills
	  ▪ Nut drivers
	  ▪ Cut off tool
	  ▪ Buffer
	  o Vaccum pumps
	• Maintenance and Storage

3. Describe tool safety	• Proper handling • Proper shapening • Cut direction • Appropriate tool for job

Achievement Criteria

Performance	Utilize lab 1 for theory assessment.
Conditions	In the classroom, complete sections that cover the description of electrical principles.
Criteria	Achieve a minimum of 70% on the basic electrical exam #1.

Line (GAC): B ELECTRICAL

Competency: B1 Describe electrical principles

Objectives

To be competent in this area, the individual must be able to:

- Describe electrical principles.

LEARNING TASKS	CONTENT

1. Describe electrical principles	• AC (Alternating Current) and DC (Direct Current) theory
	  o Ohms law
	  o Kirchhoffs law
	• Curcuits
	  o Simple
	  o Series
	  o Parallel
	  o Series parallel (combination series)
	• DC fundimentals
	• AC theory
	  o Motors
	  o Transformers
	  o Solonoids

Line (GAC): B ELECTRICAL

Competency: B2 Describe household wiring

Objectives

To be competent in this area, the individual must be able to:

- Describe household wiring and fusing.

LEARNING TASKS	CONTENT

1. Describe household wiring and fusing	• Wire sizes
	• Supply aplage
	• Proper recepticals
	• Installation of recepticals
	• Gauging of wires
	• Breaker tolerance
	• Circuit protection
	• Connection integrity
	• Fuses
	  o Analysis
	  o Identification and selection
	• Input fazes
	  o Sourse and type
	  o Frequencies
	  o Voltage
	  o 240 208
	  o 120
	  o 110

Line (GAC): A ELECTRICAL

Competency: B3 Utilize electrical test equipment

Objectives

To be competent in this area, the individual must be able to:

- Identify electrical test equipment.
- Utilize electrical test equipment.

LEARNING TASKS	CONTENT

1. Identify electrical test equipment	• Meters
	  o Multi meter
	  ▪ Analog
	  ▪ Digital
	  o Amp prob
	  o Watt meter
	  o Capicitance meter
	  o Mega OHM meter
	  o Frequency meter
	  o Pyrometer/thermometer

2. Utilize electrical test equipment	• Power applications in AC and DC curcuits
	• Curcuit isolation
	  o Voltage
	  o Continuety
	  o Resistance
	  o Current
	• Series and parallel testing

Achievement Criteria

Performance	Utilize lab 1 for theory assessment.
Conditions	In a shop setting the learner will utilize electrical test equipment on select circuits.
Criteria	Achieve a minimum of 70% on the basic electrical exam #1.

Line (GAC): B ELECTRICAL

Competency: B4 Describe the laws of electromagnetism

Objectives

To be competent in this area, the individual must be able to:

- Describe the laws of electromagnetism.
- Describe inductance in coils, transformers and relays.

LEARNING TASKS	CONTENT

1. Describe the laws of electromagnetism	• Permanent magnet
	  o Magnetic fields of flux
	  o North and south poles
	  o Invisible fields of energy
	  o Magnetic materials
	• Electro magnetism
	  o Left hand thumb rule
	• Inductive magnetism
	• Coils

2. Describe inductance in coils, transformers and relays	• Induced EMF (Electro Motive Force) o Mutual induction • Capacitance • Saturation • Turns ratio • Efficiency

Achievement Criteria

Performance	Utilize lab 1 for theory assessment.
Conditions	In the classroom, complete sections that cover the description of electrical principles.
Criteria	Achieve a minimum of 70% on the basic electrical exam #2.

Line (GAC): B ELECTRICAL

Competency: B5 Identify electric motors

Objectives

To be competent in this area, the individual must be able to:

- Describe theory of electric motors.
- Describe theory of electric switching.
- Identify electric motors.

LEARNING TASKS	CONTENT
1. Describe theory of electric motors	• Induce fields of energy o Electrical energy to mechanical energy • AC motors • DC motors • Motor poles • Capacitor start
2. Describe theory of electric switching	• Motor switches • Centrifical switches • Electronic switches • Relay switching

3. Identify electric motors	• AC motors
	  o Shaded pole
	  o Permanent magnet motors
	  o Induction motors
	• DC motors
	  o Universal motors
	  o Brushes
	• Motor poles
	• Capacitor start

Achievement Criteria

Performance	Utilize lab 2 for theory assessment.
Conditions	In the classroom, complete sections that cover the description of electrical principles.
Criteria	Achieve a minimum of 70% on the basic electrical exam #2.

Line (GAC): B ELECTRICAL

Competency: B6 Demonstrate troubleshooting with wiring schematics

Objectives

To be competent in this area, the individual must be able to:

- Identify electrical components and their symbols.
- Demonstrate troubleshooting with wiring schematics.

LEARNING TASKS	CONTENT

1. Identify electrical components and their symbols	• Electrical circuit
	  o Power source
	  o Conductor
	  o Switch
	  o Load
	• Electrical components
	  o Coil
	  o Heater
	  o Resistor
	  o Motor
	  o Switch
	  ▪ Single pole
	  ▪ Double pole
	  ▪ Single throw
	  ▪ Double throw
	• Electrical terms
	• Component and symbol chart

2. Demonstrate troubleshooting with wiring schematics	• Electrical laws
	  o OHMS laws
	  o Kirchhoff laws
	• Wiring diagrams
	  o Pictorial diagrams
	  o Wiring schematics
	• Circuit isolation

Achievement Criteria

Performance	Utilize lab 1 for theory assessment.
Conditions	In the classroom, complete sections that cover the description of electrical principles.
Criteria	Achieve a minimum of 70% on the basic electrical exam #2.

Line (GAC): C ELECTRONICS

Competency: C1 Describe solid state components

Objectives

To be competent in this area, the individual must be able to:

- Describe solid state components.

LEARNING TASKS	CONTENT
1. Describe solid state components	• Electron and electronic flow • Diodes • Silicone controlled rectifiers • Triacs • Diacs • Resistors • Capacitors

Line (GAC): C ELECTRONICS

Competency: C2 Build power supplies and electrical filter systems

Objectives

To be competent in this area, the individual must be able to:

- Build working circuits with diodes.
- Build working half-wave power supplies.

LEARNING TASKS	CONTENT

1. Build working circuits with diodes	• Materials
	  o Transformer
	  o Bread boards
	  o Resistors
	• Various components
	• Circuits
	  o Simple circuit
	  o Voltage double circuit
	  o Capacitive circuit
	• Various connections
	  o Soldered
	  o Non-soldered

2. Build working half-wave power supplies	• Half-wave voltage doubling • Capacitive circuit

Achievement Criteria

Performance	Utilize the building circuit lab for theory assessment.
Conditions	In the shop, complete sections that cover the description of building power supplies and electrical filter systems.
Criteria	Achieve a minimum of 70% on the basic electrical exam #2.

Line (GAC): C ELECTRONICS

Competency: C3 Describe sine wave and rectification

Objectives

To be competent in this area, the individual must be able to:

- Identify sine wave and applications in alternating current.
- Identify sine wave with an oscilloscope.
- Describe silicone controlled rectifiers for AC and DC circuits.
- Identify diode and silicon controlled rectifiers.
- Explain full and half wave rectification.

LEARNING TASKS	CONTENT
1. Identify sine wave and applications in alternating current	• Square wave • Full wave • Half wave
2. Identify sine wave with an oscilloscope	• Adjust settings • AC full wave • DC half wave • Square wave • EFI filtering

3. Describe silicon controlled rectifiers for AC and DC circuits	• Rectification
	  o DC silicon controlled rectifieres
	• Switching
	  o AC triacs
	  o Diacs
	• Doping agents
	• PN junctions
	• Holes
	• Acceptors
	• Silicones
	• Molicules
	• Insolators
	• Conductors
	• Semy conductors

4. Identify diode and silicone controlled rectifiers	• PN junctions
	• DC device
	• Rectifies full sign wave
	• Diods
	  o Zener
	  o Silicon

5. Explain full and half wave rectification	• Voltage splitting
	• Full wave
	  o DC circuit
	  o Full voltage
	• Half (pulse) wave
	  o Half wave voltage doubling

Line (GAC): D ANCILLARY PRODUCTS

Competency: D1 Describe principles and operation of garbage disposals

Objectives

To be competent in this area, the individual must be able to:

- Describe principles and operation of garbage disposals.
- Describe garbage disposal installation.
- Describe the theory of garbage disposer functions.

LEARNING TASKS	CONTENT
1. Describe principles and operation of garbage disposals	• Benefits and environmental principles • Efficient disposal of waste products • Loading procedures • Continuous feed • Batch feed • Reversible and non-reversible
2. Describe garbage disposal installation	• Requirements o Pluming o Electrical o Monisipal code
3. Describe the theory of garbage disposer functions	• Disposer functions • Safety device • Theory of operation

Line (GAC): D ANCILLARY PRODUCTS

Competency: D2 Perform services on garbage disposals

Objectives

To be competent in this area, the individual must be able to:

- Perform motor test of garbage disposal.
- Perform motor switch and safety device repairs of garbage disposals.

LEARNING TASKS	CONTENT
1. Perform services on garbage disposal.	• Testing of switches • Un-jamming • Current testing
2. Perform motor switch and safety device repairs of garbage disposals.	• Hook up motor test cord • Motor switch testing • Test with meter • Over load protector • Test windings and meter

Achievement Criteria

Performance	Utilize waste disposal and trash compactor labs for theory and practical assessment.
Conditions	In the classroom, complete sections that cover the description of garbage disposal and trash compactors.
Criteria	Achieve a minimum of 70% on the ancillary products exam.

Line (GAC): D ANCILLARY PRODUCTS

Competency: D3 Describe principles and operation of trash compactors

Objectives

To be competent in this area, the individual must be able to:

- Describe installation and power requirements of trash compactors.
- Describe principles and operation of trash compactors.
- Describe line diagrams of various cycles.

LEARNING TASKS	CONTENT
1. Describe installation and power requirements of trash compactors	• Location consideration • Electrical connections • Level
2. Describe principles and operation of trash compactors	• Reduce size of garbage • Electrical mechanical ram operation • Limit swich controlled
3. Describe line diagrams of various cycle	• Cycles o Downward stroke o Upward stroke

Line (GAC): D ANCILLARY PRODUCTS

Competency: D4 Perform services on trash compactors

Objectives

To be competent in this area, the individual must be able to:

- Perform testing on all switches for trash compactors.
- Perform motor and relay replacement on trash compactors.
- Demonstrate motor cycling for forward and reverse motion.
- Perform diagnosis of compactor faults.

LEARNING TASKS	CONTENT
1. Perform testing on all switches for trash compactors	• Mechanical and electrical testing
2. Perform motor and relay replacement on trash compactors	• Accessing and removal techniques
3. Demonstrate motor cycling for forward and reverse motion	• Mechanical drive system • Electrical componenet operation
4. Perform diagnosis of compactor faults	• Common faults • Spacific component failer • Circuit analysis

Achievement Criteria

Performance	Utilize waste disposal and trash compactor labs for theory and practical assessment.
Conditions	In the classroom, complete sections that cover the description of garbage disposal and trash compactors.
Criteria	Achieve a minimum of 70% on the ancillary products exam.

Line (GAC): D ANCILLARY PRODUCTS

Competency: D5 Describe principles and operation of electric water heaters

Objectives

To be competent in this area, the individual must be able to:

- Describe installation and operation of electric water heater.
- Describe safety procedures for water heaters.
- Describe the operation of safety thermostats.

LEARNING TASKS	CONTENT
1. Describe installation and operation of electric water heater	• Local installation codes for power and water supply of water heaters • Voltages • Polarity and grounding • Power and pluming requirements o Drainage • Locations
2. Describe safety procedures for water heaters	• Power off • Draining water • Full tank of water before water is turned on • Not working on water side while power on • Not energizing power while there is water • Monitor power • Temperature and pressure valves
3. Describe the operation of safety thermostats	• Temperature and pressure releaf valve o High temp high pressure control • High temperature limit protection • Bi-metal high temperature limit

Line (GAC): D ANCILLARY PRODUCTS

Competency: D6 Perform services on electric water heaters

Objectives

To be competent in this area, the individual must be able to:

- Perform heater element test and repair.
- Perform a systematic fault diagnosis and repair of water heater.

LEARNING TASKS	CONTENT
1. Perform heater element test and repair	• Multi meter test on element • Replacement procedures
2. Perform a systematic fault diagnosis and repair of water heater	• Meter usage • Scymatic diagnosis • Component removal

Achievement Criteria

Performance	Utilize hot water heaters, electric & gas troubleshooting lab for theory and practical assessment.
Conditions	In the shop, complete sections that cover the performance of electric water heaters.
Criteria	Achieve a minimum of 70% on the ancillary products exam.

Line (GAC): E ELECTRIC DRYERS

Competency: E1 Describe electric dryer installation

Objectives

To be competent in this area, the individual must be able to:

- Describe uncrating and installation procedures for dryers.
- Describe venting of common models.
- Describe principles of clothes drying.

LEARNING TASKS	CONTENT
1. Describe uncrating and installation procedures for dryers	• Manufacture specific uncrating procedure • Location • Electrical requirements • Venting requirements • Leveling

2. Describe venting of common models	• Limitations
	• Types of vents
	  o Solid
	  o Corrigated
	  o Galvinized
	• Elbows
	• Vent caps

3. Describe principles of clothes drying	• Positive and negative air flow • Tumble action • Application of heat

Line (GAC): E ELECTRIC DRYERS

Competency: E2 Service electric dryers

Objectives

To be competent in this area, the individual must be able to:

- Describe safety rules of service and repair.
- Demonstrate the disassembly of dryers.
- Demonstrate timer identification and testing.
- Service timer.
- Demonstrate line isolation from schematics for diagnostic purposes.

LEARNING TASKS	CONTENT
1. Describe safety rules of service and repair	• Disconnect power • Connection of vent o Mold and mildew prevention
2. Demonstrate the disassembly of dryers	• Manufature spacifics • Pannel removal • Component removal
3. Demonstrate timer identification and testing	• Mechanical analog timer • Electronic timers
4. Service timer	• Cycle chart (cam chart) • Function charts
5 Demonstrate line isolation from schematics for diagnostic purposes	• Fault identification • Line isolation from schematic • Line transposing to non-functioning component

Achievement Criteria

Performance	Utilize the Whirlpool, Performa, Amana, Maytag, Bosch, Euro-tech, GE, Frigidaire/Electrolux dryer labs for theory and practical assessment.
Conditions	In the shop, complete sections that cover the service of electric dryers.
Criteria	Achieve a minimum of 70% on the dryer exam #1 and #2.

Line (GAC): E ELECTRIC DRYERS

Competency: E3 Perform electric dryer repairs

Objectives

To be competent in this area, the individual must be able to:

- Perform electrical component tests and repairs.
- Perform mechanical component tests and repairs.

LEARNING TASKS	CONTENT

1. Perform electrical component tests and repairs	• Switches
	  o Electric
	  o Micro
	• Heater elements
	• Timer
	• Motors
	• Thermostats
	• Electronic components
	  o Thermisters
	  o Electronic boards

2. Perform mechanical component tests and repairs	• Drums • Belts • Rollers • Idler pullies • Drum glides • Rear and front bulk heads • Cabnets

Achievement Criteria

Performance	Utilize the Whirlpool, Performa, Amana, Maytag, Bosch, Euro-tech, GE, Frigidaire/Electrolux dryer labs for theory and practical assessment.
Conditions	In the shop, complete sections that cover the performance of electric dryer repairs.
Criteria	Achieve a minimum of 70% on the dryer exam #1 and #2.

Line (GAC): F ELECTRIC RANGES

Competency: F1 Describe electric range installation

Objectives

To be competent in this area, the individual must be able to:

- Describe power source and kitchen floor safety.
- Describe uncrating and installing electric ranges.

LEARNING TASKS	CONTENT

1. Describe power source and kitchen floor safety	• Plug type and location
	• Floor type
	  o Cabinetry and floor protection
	• Tools
	  o Air sled
	  o Protection materials
	  o Meters
	  ▪ Multi meter
	  o All dolly

2. Describe uncrating and installing electric ranges	• Manufacture specific uncrating procedure • Location • Electrical requirements • Venting requirements • Leveling

Line (GAC): F ELECTRIC RANGES

Competency: F2 Perform electric range services

Objectives

To be competent in this area, the individual must be able to:

- Describe safety rules of service and repair.
- Demonstrate the disassembly of electric ranges.
- Demonstrate electronic control and testing.
- Service self cleaning ovens.
- Demonstrate line isolation from schematics for diagnostic purposes.

LEARNING TASKS	CONTENT
1. Describe safety rules of service and repair	• Disconnect power • Apply standard safe practices
2. Demonstrate the disassembly of electric ranges	• Manufature spacifics • Pannel removal • Component removal
3. Demonstrate electronic control and testing	• Monitor of supervisory circuit • Monitor oven performance o Temperature test • Calibration of oven controls

4. Service self cleaning ovens	• System identifcation
	  o Self cleaning
	  o Continuous cleaning
	  o Standard

5. Demonstrate line isolation from schematics for diagnostic purposes	• Fault identification • Line isolation from schematic • Line transposing to non-functioning component

Achievement Criteria

Performance	Utilize the electric ranges labs for theory and practical assessment.
Conditions	In the shop, complete sections that cover the service of electric ranges.
Criteria	Achieve a minimum of 70% on the basic range and self clean exam.

Line (GAC): F ELECTRIC RANGES

Competency: F3 Perform electric range repairs

Objectives

To be competent in this area, the individual must be able to:

- Perform electrical component tests and repairs.
- Perform mechanical component tests and repairs.

LEARNING TASKS	CONTENT

1. Perform electrical component tests and repairs	• Switches
	  o Electric
	  o Micro
	  o Infinate
	• Heater elements
	• Fuzes
	• Motors
	• Terminal blocks
	• Thermostats
	• Electronic components
	  o Oven sensors
	  o Electronic boards

2. Perform mechanical component tests and repairs	• Control pannels
	• Side pannels
	• Main tops
	• Oven doors
	• Locking mechanisms
	• Hinges
	• Storage drawers
	  o Rollers
	  o Rails
	• Leveling system

Achievement Criteria

Performance	Utilize the electric ranges labs for theory and practical assessment.
Conditions	In the classroom, complete sections that cover the performance of electrical range repairs.
Criteria	Achieve a minimum of 70% on the basic range exam.

Line (GAC): G AUTOMATIC WASHERS

Competency: G1 Describe automatic washer installation

Objectives

To be competent in this area, the individual must be able to:

- Describe uncrating and installation procedures for washers.
- Describe principles of clothes washing.

LEARNING TASKS	CONTENT

1. Describe uncrating and installation procedures for washers	• Manufacture specific uncrating procedure
	• Local plumbing and electrical codes
	• Location
	• Flooring
	  o Safety
	  o Structure
	• Leveling

2. Describe principles of clothes washing	• Top load
	  o Agitation wash action
	  ▪ Motor
	  ▪ Transmission
	  ▪ Direct drive
	  ▪ Belt drive
	  o High efficiency/pulsating
	• Front load
	  o Tumble wash action
	  ▪ Internal heat
	  ▪ External feed
	  o High RPM water extraction

Line (GAC): G AUTOMATIC WASHERS

Competency: G2 Service automatic washers

Objectives

To be competent in this area, the individual must be able to:

- Describe safety rules of service and repair.
- Demonstrate the disassembly of washers.
- Demonstrate timer identification and testing.
- Demonstrate electronic control and testing.
- Demonstrate line isolation from schematics for diagnostic purposes.

LEARNING TASKS	CONTENT
1. Describe safety rules of service and repair	• Disconnect power • Apply standard safe practices • Floor type o Cabinetry and floor protection
2. Demonstrate the disassembly of washers	• Manufature spacifics • Pannel removal • Component removal
3. Demonstrate timer identification and testing	• Mechanical analog timer • Electronic timers
4. Demonstrate electronic control and testing	• Monitor of supervisory circuit and washer performance
5. Demonstrate line isolation from schematics for diagnostic purposes	• Fault identification • Line isolation from schematic • Line transposing to non-functioning component

Achievement Criteria

Performance	Utilize the automatic washer lab 1 for theory and practical assessment.
Conditions	In the shop, complete sections that cover the service of automatic washers.
Criteria	Achieve a minimum of 70% on exam #1 and the top load washer exam.

Line (GAC): G AUTOMATIC WASHERS

Competency: G3 Repair automatic washers

Objectives

To be competent in this area, the individual must be able to:

- Perform electrical component tests and repairs.
- Perform mechanical component tests and repairs.

LEARNING TASKS	CONTENT

1. Perform electrical component tests and repairs	• Switches
	  o Electric
	  o Micro
	• Heater elements
	• Timer
	• Water valves
	• Flow meters
	• Vibration sensor
	• Door switches
	• Door lock switches
	• Solonoids
	• Wax motors
	• Motor control board
	• Motors
	• Thermostats
	• Pressure switches
	• Electronic components
	  o Thermisters
	  o Electronic boards
	  o Speed boards
	  o Reactors

2. Perform mechanical component tests and repairs	• Drain pumps • Cabnets • Transmissions • Clutch assemblies • Bearings and seals • Dispensors • Belts • Agitators • Suspention components

- Dampers
- Leveling legs
- Washer base
- Snubbers
- Flood switches
- Spin basket
- Outter tank
- Fill spout
- Flume-spout

Achievement Criteria

Performance	Utilize the schematics/cam chart troubleshooting lab for theory and practical assessment.
Conditions	In the shop, complete sections that cover the performance of automatic washer repairs.
Criteria	Achieve a minimum of 70% on exam #1 and the top load washer exam.

Line (GAC): H AUTOMATIC ELECTRIC DISHWASHERS

Competency: H1 Describe electric dishwasher installation

Objectives

To be competent in this area, the individual must be able to:

- Describe uncrating and installation procedures for dishwashers.
- Describe principles of dish washing.

LEARNING TASKS	CONTENT

1. Describe uncrating and installation procedures for dishwashers	• Portable
	  o Manufacture specific uncrating procedure
	  o Local plumbing and electrical codes
	  o Location
	  o Hook up to faucet
	• Built in
	  o Manufacture specific uncrating procedure
	  o Local plumbing and electrical codes
	  o Location
	  o Cabinet cut out
	  o Flooring
	  ▪ Safety
	  ▪ Structure
	  o Leveling

2. Describe principles of dish washing	• Mechanical energy
	• Chemical energy
	• Thermal energy
	• Water distribution
	• Wash action
	  o Spray arm
	  o Wash towers
	  o Internal heat

Line (GAC): H AUTOMATIC ELECTRIC DISHWASHERS

Competency: H2 Service dishwashers

Objectives

To be competent in this area, the individual must be able to:

- Describe safety rules of service and repair.
- Demonstrate the disassembly of dishwashers.
- Demonstrate timer identification and testing.
- Demonstrate electronic control and testing.
- Demonstrate line isolation from schematics for diagnostic purposes.

LEARNING TASKS	CONTENT
1. Describe safety rules of service and repair	• Disconnect power • Apply standard safe practices • Floor type o Cabinetry and floor protection
2. Demonstrate the disassembly of dishwashers	• Manufature spacifics • Pannel removal • Component removal
3. Demonstrate timer identification and testing	• Mechanical analog timer • Electronic timers
4. Demonstrate electronic control and testing	• Monitor of supervisory circuit and washer performance
5. Demonstrate line isolation from schematics for diagnostic purposes	• Fault identification • Line isolation from schematic • Line transposing to non-functioning component

Achievement Criteria

Performance	Utilize the dishwasher review lab exercise sheets for theory and practical assessment.
Conditions	In the shop, complete sections that cover the service of dishwashers.
Criteria	Achieve a minimum of 70% on exam #1.

Line (GAC): H AUTOMATIC ELECTRIC DISHWASHERS

Competency: H3 Diagnosis of wash cycles

Objectives

To be competent in this area, the individual must be able to:

- Identify dishwasher wash cycles.
- Diagnose wash cycles.

LEARNING TASKS	CONTENT
1. Identify dishwasher wash cycles	• Washing • Drying • Sanitizing • Cleaning
2. Diagnose wash cycles	• Timed wash • Delayed wash • Drain cycle • Heating elements • Electrical supply • Solenoids • Floats • Turbo jets

Achievement Criteria

Performance	Utilize the dishwasher schematics and diagnostics lab exercise sheets for theory and practical assessment.
Conditions	In the shop, complete sections that cover diagnosing wash cycles.
Criteria	Achieve a minimum of 70% on exam #1.

Line (GAC): I DOMESTIC REFRIGERATION AND AIR CONDITIONING

Competency: I1 Obtain CFC Refrigerant certification

Objectives

To be competent in this area, the individual must be able to:

- Describe the effects of ozone depleting substance on the environment.
- Apply legislated procedures when dealing with systems containing refrigerant.
- Describe procedures to be followed when dealing with systems containing refrigerant.

LEARNING TASKS	CONTENT
1. Describe the effects of ozone depleting substance of the environment	• Ozone depletion • CFC effect

2. Apply legislated procedures when dealing with systems containing refrigerant	• International
	  o Montreal protocol on substances that deplete the ozone layer
	  o Kyoto protocol to the United Nations framework convention on climate change
	• Canadian Environmental Protection Agency
	• Provincial regulations
	  o Ozone depleting substances and other halocarbons regulation
	  o Waste management act
	• Training requirements
	  o Environmental awareness training course on ozone depleting substances control
	  o Certification
	• Conservation objectives

3. Describe procedures to be followed when dealing with systems containing refrigerant	• Code of practice for the reduction of chlorofluorocarbon emissions from refrigeration and air conditioning systems
	• Service handouts
	• Inventory assessment and record keeping
	• Design and general practices
	• Equipment
	• Refrigerant
	  o Recovery
	  o Reuse
	  o Disposal
	• Leak testing procedures
	• Flushing and cleaning
	• Purging equipment containers

Achievement Criteria

Performance	Utilize the cutting and swaging lab 1, braising techniques lab 2, heat exchanger fabrication lab 3 and system construction lab 4 for theory and practical assessment.
Conditions	In the classroom, complete sections that cover CFC refrigerant certification.
Criteria	Achieve a minimum of 70% on the CFC recovery exam.

Line (GAC): I DOMESTIC REFRIGERATION AND AIR CONDITIONING

Competency: I2 Describe refrigeration and air conditioning principles and installation

Objectives

To be competent in this area, the individual must be able to:

- Describe principles of domestic refrigeration.
- Describe principles of domestic air conditioning.
- Describe uncrating and installation procedures for domestic refrigeration and air conditioning.

LEARNING TASKS	CONTENT

1. Describe principles of domestic refrigeration	• Laws of thermal dynamics
	• Seal system principals
	• Removal of heat
	• Self defrost
	• Circulation refrigerant
	  o High pressure
	  o Low pressure
	• Leak testing
	• Capilary tube
	• Internal air flow

2. Describe principles of domestic air conditioning	• Laws of thermal dynamics
	• Seal system principals
	• Output to area
	• Removal of moisture
	• Circulation refrigerant
	  o High pressure
	  o Low pressure
	• Capilary tube
	• Room internal air flow
	• Temperature generation

3. Describe uncrating and installation procedures for domestic refrigeration and air conditioning	• Manufacture specific uncrating procedure
	• Local plumbing and electrical codes
	• Location
	• Cabinet cut out
	• Flooring
	  o Safety
	  o Structure
	• Leveling

Line (GAC): I REFRIGERATION AND AIRCONDITIONING

Competency: I3 Service domestic refrigeration

Objectives

To be competent in this area, the individual must be able to:

- Describe safety rules of service and repair.
- Demonstrate the disassembly of domestic refrigeration.
- Demonstrate timer identification and testing.
- Demonstrate electronic control and testing.
- Demonstrate line isolation from schematics for diagnostic purposes.

LEARNING TASKS	CONTENT
1. Describe safety rules of service and repair	• Disconnect power • Disconnect water • Apply standard safe practices • Phosgene hazard • Refrigerant identification • High pressured gas hazard • Floor protection
2. Demonstrate the disassembly of domestic refrigeration	• Manufature spacifics • Pannel removal • Component removal • Evacuation and recharge
3. Demonstrate timer identification and testing	• Mechanical timers • Electronic timers

4. Demonstrate electronic control and testing	• Monitor of supervisory circuit and refrigeration performance
	• Temperature testing
	  o External
	  o Internal
	• Pressure testing of sealed system

5. Demonstrate line isolation from schematics for diagnostic purposes	• Fault identification • Line isolation from schematic • Line transposing to non-functioning component

Achievement Criteria

Performance	Utilize the cutting and swaging lab 1, braising techniques lab 2, heat exchanger fabrication lab 3 and system construction lab 4 for theory and practical assessment.
Conditions	In the shop, complete sections that cover the service of domestic refrigeration.
Criteria	Achieve a minimum of 70% on the refrigeration exam #1, #2 and #3.

Line (GAC): I REFRIGERATION AND AIRCONDITIONING

Competency: I4 Service domestic air conditioning

Objectives

To be competent in this area, the individual must be able to:

- Describe safety rules of service and repair.
- Demonstrate the disassembly of domestic air conditioning.
- Demonstrate electronic control and testing.
- Demonstrate line isolation from schematics for diagnostic purposes.

LEARNING TASKS	CONTENT
1. Describe safety rules of service and repair	• Disconnect power • Connect drain • Apply standard safe practices • Phosgene hazard • High pressured gas hazard • Floor protection • PPE
2. Demonstrate the disassembly of domestic air conditioning	• Manufature spacifics • Pannel removal • Component removal • Mounting • Outlet venting • Source power
3. Demonstrate electronic control and testing	• Monitor of supervisory circuit and air conditioning performance • Temperature testing o Output o Input
4. Demonstrate line isolation from schematics for diagnostic purposes	• Fault identification • Line isolation from schematic • Line transposing to non-functioning component

Achievement Criteria

Performance	Utilize the cutting and swaging lab 1, braising techniques lab 2, heat exchanger fabrication lab 3 and system construction lab 4 for theory and practical assessment.
Conditions	In the shop, complete sections that cover the service of domestic air conditioning.
Criteria	Achieve a minimum of 70% on the air conditioning exam.

Line (GAC): J MICROWAVE TECHNOLOGIES

Competency: J1 Describe microwave installation

Objectives

To be competent in this area, the individual must be able to:

- Describe power source and unit accommodation.
- Describe uncrating and installing microwaves.

LEARNING TASKS	CONTENT

1. Describe power source and unit accommodation	• Plug type and location
	• Cabinet allocation
	• Tools
	  o Protection materials
	  o All dolly
	  o Radiant leak detector
	  o Meters
	  ▪ Multi meter

2. Describe uncrating and installing microwaves	• Manufacture specific uncrating procedure • Location • Electrical requirements • Venting requirements • Mounting • Leveling

Line (GAC): J MICROWAVE TECHNOLOGIES

Competency: J2 Perform microwave service

Objectives

To be competent in this area, the individual must be able to:

- Describe safety rules of service and repair.
- Demonstrate the disassembly of microwaves.
- Demonstrate electronic control and testing.
- Demonstrate line isolation from schematics for diagnostic purposes.

LEARNING TASKS	CONTENT
1. Describe safety rules of service and repair	• Disconnect power • Apply standard safe practices • PPE
2. Demonstrate the disassembly of microwaves	• Manufature spacifics • Pannel removal • Component removal • Dismount
3. Demonstrate electrontic control and testing	• Monitor of supervisory circuit • Monitor microwave performance o Temperature test • Test megnetron
4. Demonstrate line isolation from schematics for diagnostic purposes	• Fault identification • Line isolation from schematic • Line transposing to non-functioning component

Achievement Criteria

Performance	Utilize the components, schematics, output test of microwave tear down lab project for theory and practical assessment.
Conditions	In the shop, complete sections that cover the service of microwave repairs.
Criteria	Achieve a minimum of 70% on the microwave exam.

Line (GAC): J MICROWAVE TECHNOLOGIES

Competency: J3 Perform microwave repairs

Objectives

To be competent in this area, the individual must be able to:

- Perform electrical component tests and repairs.
- Perform mechanical component tests and repairs.

LEARNING TASKS	CONTENT

1. Perform electrical component tests and repairs	• Heater elements
	• Fuzes
	• Motors
	• Terminal blocks
	• Thermostats
	• Meat prob
	• Low voltage components
	  o Control pannel board
	  o Cooling fan
	  o Stirrer motors
	  o Turn table motors
	  o Lamp
	  o Monitor switches
	  o Thermal cut outs
	• High voltage components
	  o Diods
	  o Triacs
	  o Transformer
	  o Megnetron
	  o Capasator
	• Electronic components
	  o Cavity sensors
	  o Electronic boards

2. Perform mechanical component tests and repairs	• Control pannel • Side pannels • Microwave cabinet • Microwave doors • Locking mechanisms • Hinges • Turn table

Achievement Criteria

Performance	Utilize the components, schematics, output test of microwave tear down lab project for theory and practical assessment.
Conditions	In the shop, complete sections that cover the performance of microwave repairs.
Criteria	Achieve a minimum of 70% on the microwave exam.

Line (GAC): K BC PROVINCIAL "C" GAS CERTIFICATE

Competency: K1 Define the function of the Gas Safety Branch in BC

Objectives

To be competent in this area, the individual must be able to:

- Define the function of the Gas Safety Branch in BC.

LEARNING TASKS	CONTENT
1. Define the function of the Gas Safety Branch in BC	• Gas Safety Regulation • Safety orders • Safety Standards Act • Regulations Part 1-(General Qualification and Licensing Provisions)

Line (GAC): K BC PROVINCIAL "C" GAS CERTIFICATE

Competency: K2 Define Gas Code/Regulations pertaining to permits, licence and inspections

Objectives

To be competent in this area, the individual must be able to:

- Define Gas Code/Regulations pertaining to permits, licence and inspections.

LEARNING TASKS	CONTENT
1. Define Gas Code/Regulations pertaining to permits, license and inspections	• Directives • Safety orders • Safety Standards Act • Regulations • Maximum KW input (82KW) • Gas Appliance Service-Certificate of Qualification • Requirements for permits • Duties

Line (GAC): K BC PROVINCIAL "C" GAS CERTIFICATE

Competency: K3 Define safety practices of natural and propane gases

Objectives

To be competent in this area, the individual must be able to:

- Define safety practices of natural and propane gases.

LEARNING TASKS	CONTENT
1. Define safety practices of natural and propane gases	• Properties of NG (Natural Gas) • Properties of LPG (Propane) • Storage requirements • Transportation requirements • LPG stored and transferred in liquid state • Exposed ignition sources

Line (GAC): K BC PROVINCIAL "C" GAS CERTIFICATE

Competency: K4 Apply regulations and safety practices

Objectives

To be competent in this area, the individual must be able to:

- Apply regulations and safety practices.

LEARNING TASKS	CONTENT
1. Apply regulations and safety practices	• Locate gas shut-off switch • 80% fill rule for storage containers • Regulator size to BTU output

Line (GAC): L GAS APPLIANCES

Competency: L1 Describe the operation of gas pressure regulators

Objectives

To be competent in this area, the individual must be able to:

- Describe the operation of gas pressure regulators.

LEARNING TASKS	CONTENT
1. Describe the operation of gas pressure regulators	• Bellow type (diaphragm) • Load • Downstream pressure • Inlet pressure • Water column pressure • Loading and unloading • Hunting • Shut-off on upstream • Safety release

Line (GAC): L GAS APPLIANCES

Competency: L2 Describe atmospheric burner operation

Objectives

To be competent in this area, the individual must be able to:

- Describe atmospheric burner operation.

LEARNING TASKS	CONTENT

1. Describe atmospheric burner operation	• 30-50% primary air
	• Mono port
	• Multi port
	• Infrared radiant burner
	• Components
	  o Air shutter
	  o Orifice
	  ▪ Fixed
	  ▪ Adjustable
	  ▪ Cap (universal)
	  o Venturi
	  o Burner port
	• Flame retention
	• Primary air
	• Secondary air

Line (GAC): L GAS APPLIANCES

Competency: L3 Calculate venting requirements

Objectives

To be competent in this area, the individual must be able to:

- Describe appliance venting.
- Calculate venting requirements.

LEARNING TASKS	CONTENT
1. Describe appliance venting	• Draft control • Direct venting • Vent sizing • Section 8 Code Book • Removes products of combustion • Flute • Draft hood
2. Calculate venting requirements	• Category I, II, III, IV • Type A, B, BW, C, L, BN, flexible • H= Vent height • L= Lateral • D=Diameter of connectors

Line (GAC): L GAS APPLIANCES

Competency: L4 Perform gas appliance services

Objectives

To be competent in this area, the individual must be able to:

- Perform gas appliance services.

LEARNING TASKS	CONTENT

1. Perform gas appliance services	• Identify source
	• Identify type of gas
	• Flame analysis
	• Diagnosis
	  o Soot build-up
	  o Flashback
	  o Extinction pop
	  o Floating flames
	  o Dust in flames
	• Disassembly
	• Cleaning
	• Leak detection
	• Gas valve operation

Achievement Criteria

Performance	Apply standards and code requirements as required by BC Gas Safety Branch.
Conditions	In the shop, complete sections that cover the service of gas appliances.
Criteria	Achieve a minimum of 70% on the gas appliance exam.

Line (GAC): L GAS APPLIANCES

Competency: L5 Perform gas appliance repairs

Objectives

To be competent in this area, the individual must be able to:

- Perform gas appliance repairs.

LEARNING TASKS	CONTENT
1. Perform gas appliance repairs	• Pilot light maintenance • Burner replacement • Flute replacement • Auto-start replacement and adjustment • Leak repair • Vent installment • Conversions • Component replacement • Gas leak repair

Achievement Criteria

Performance	Apply standards and code requirements as required by BC Gas Safety Branch.
Conditions	In the shop, complete sections that cover the performance of gas appliance repairs.
Criteria	Achieve a minimum of 70% on the gas appliance exam.

Section 4

TRAINING PROVIDER STANDARDS

Facility Requirements

Classroom Area

- Comfortable seating and tables suitable for training, teaching, lecturing
- Compliance with all local and national fire code and occupational safety requirements
- Lighting controls to allow easy visibility of projection screen while also allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating/Air conditioning for comfort all year round
- In-room temperature regulation to ensure comfortable room temperature
- In-room ventilation sufficient to control training room temperature
- Acoustics in the room must allow audibility of the instructor
- White marking board with pens and eraser (optional: flipchart in similar size)
- Projection screen or projection area at front of classroom
- Overhead projector and/or multi-media projector

Shop Area

- Ceiling shall be a minimum height of sixteen feet or as varied by good engineering practices and code
- Suitable demonstration area
- Lighting appropriate for good vision in ambient light
- Compliance with all local and national fire code and occupational safety requirements
- Must meet Municipal and Provincial bylaws in regards to waste water management and environmental laws

Lab Requirements

- Does not apply

Student Facilities

- Does not apply

Instructor's Office Space

- Does not apply

Other

- Does not apply

Tools and Equipment

Shop Equipment

Required

- 2 pound hammer
- air sleds
- Allen wrenches
- cold chisels
- combination wrenches
- crimping pliers
- dead blow hammer
- drifts
- drill bits
- drills
- electrostatic discharge (ESD) strap
- files (round, half-round, triangular, flat)
- flashlight
- hacksaws
- hammer
- heat guns
- knife
- ladders
- line splitter
- lineman's pliers
- locking pliers
- needle nose pliers
- nut drivers
- pipe wrench
- pullers
- punches
- ratchet/socket wrenches
- scrapers
- screwdrivers
- side cutter pliers
- sliders
- slip joint pliers
- snap ring pliers
- tamper proof/security bit set
- tin snips
- trouble light
- water pump pliers
- wire stripper

Shop (Facility) Tools

Standard Tools

- air compressor
- anti-static sheet
- appliance carts
- computer
- dollies
- grinder/wire wheel
- impact tools
- moving straps
- power lift
- saws
- shop vacuum
- tape machine
- taps and dies
- torque wrench
- truck lifts
- vices

Specialty Tools

Common Measuring/Testing Equipment

- ammeter
- calculator
- capacitor tester
- measuring tape
- microwave leak detector
- multimeter
- oven temperature tester
- temperature recorders
- test harnesses
- thermometer
- volt pen
- water hardness test kit
- watt meter/recorder

Specialty Dishwasher, Washer and Dryer Tools

- agitator removers
- bearing installer
- brake and clutch tools
- hose clamp pliers
- pinch-off pliers
- spanner wrenches
- spring tools
- tub nut wrenches

Specialty Refrigeration Tools

- charging cylinder
- compound gauges
- condenser brush
- electronic scale
- fin comb
- micron gauge
- nitrogen pressure gauge
- nitrogen tank
- pinch-off pliers
- process tube adapter set
- reamers
- recovery/recycling equipment
- refrigerant leak detector
- wedging and flaring tools
- temporary piercing valves
- tube benders
- tubing cutters
- ultra-violet light
- vacuum pump

Specialty Gas Tools

- carbon monoxide detector
- gas leak detector
- manometer

Soldering and Brazing Tools

- flame arrester
- gauges
- heat proof work mats
- heat shield
- oxy-acetylene, propane and acetylene torches and tips
- soldering gun

Student Tools (supplied by student)

Required

- boot slip covers
- drop sheets
- face shield
- fire extinguisher
- first aid kit
- gloves
- hard hats
- hearing protection
- knee pads
- reflective gear
- respiratory mask
- safety boots
- safety glasses

Reference Materials

Required Reference Materials

- APPL 1110- Basic Electricity -**SKU 10342466**
- BC Gas Safety Code -**SKU 10308905**
- Canadian Natural Gas & Propane Installation Code Book- **SKU 10333136**
- Dutton Fundamentals Gas Utilization- **SKU 10074619**
- APPL 1115 Solid State Electronics –**SKU 10043929**
- APPL 1230 Microwave Ovens and Ancillary Products-**SKU 10044049**
- APPL 1125 Electric Dryers-**SKU 10043882**
- APPL 1130 Electric Range Standard and Self Cleaning-**SKU 10043891**
- APPL 1215 Electric Dishwasher-**SKU 10044001**
- Whitman Refrigeration & Air Conditioning Tech-**SKU 10278369**
- Carrier Canada General Training Heating 2- **SKU 10074596**

Recommended Resources

- http://www.skilledtradesbc.ca/
- http://www.red-seal.ca/

Suggested Texts

- Video on Fire Extinguishers (Province of BC Ministry Of Skills and Labor –PS1008.VS)
- Video Fighting Fires with Portable Extinguishers (TH9362 F54 C.1 NFPA)
- Video Ladder safety (Workers Compensation Board T55 L344 1995)
- Video Safe and Effective Grinding (Safety Care Inc. no number assigned)
- DVD Safety Awareness (Vocam publishing T55 S344 2009 C.1)
- Video Safety Common Core Tools (T55 T66 1977 Kwantlen Video)
- Understanding Eye Safety at Work (Vocam Publishing T55.3 E98 U64 2008 C.1)
- DVD Resistors, Batteries and Switches (McIntyre Media Inc. TK 452E64 2006 PT.1 C.1)
- DVD Electrical Principles (McIntyre Media Inc. TK454 E472 2007 C.1)
- DVD Semiconductors, Transistors, and Diodes (McIntyre Media Inc. TK7870 E64 2007 PT.1 C.1)
- DVD Capacitors, Fuses and coils (McIntyre Media Inc. TK452 E64 2006 PT.2 C.1)
- DVD Transformers, Relays and Motors (McIntyre Media Inc.)
- DVD Thyristors and Piezo (McIntyre Media Inc. TK7870 E64 2007 PT.3 C.1)
- Video Gas Trouble shooting (TH7466 G3 G46 NO.10 GTH2-10V)
- Video Installation Practices (TH 7466 G3 G46 NO.8)
- Video Introduction to Electricity (GTE2-1V TK4035 A35 G43 NO.1)
- Video Wiring Diagrams (GTE2-3V TK4035 G43 NO.3)
- DVD Electrical Trouble Shooting (McIntyre Media Inc. TK452 E643 2006 C.1)
- DVD Electrical Safety (McIntyre Media Inc. TK152 E432 2004 C.1)
- DVD Electrical Circuits Ohm's Law (McIntyre Media Inc. TK454 E47 2007 C.1)

NOTE:

This list of Reference Materials is for training providers. Apprentices should contact their preferred training provider for a list of recommended or required texts for this program.

Instructor Requirements

Occupational Qualifications

The instructor must possess:

- A British Columbia Appliance Service Technician Inter-Provincial Certificate of Qualification, or
- Certificate of Qualification from another Canadian jurisdiction complete with Red Seal Endorsement

Work Experience

A minimum of 5 years experience working in the industry as a journeyperson with a diverse background in the Appliance industry.

Instructional Experience and Education

It is preferred that the instructor also possesses one of the following:

- Instructors Certificate (minimum 30 hr course)
- Instructors must have or be registered in an Instructor's Diploma Program, to be completed within a five year period or hold a Bachelors or Masters Degree in Education