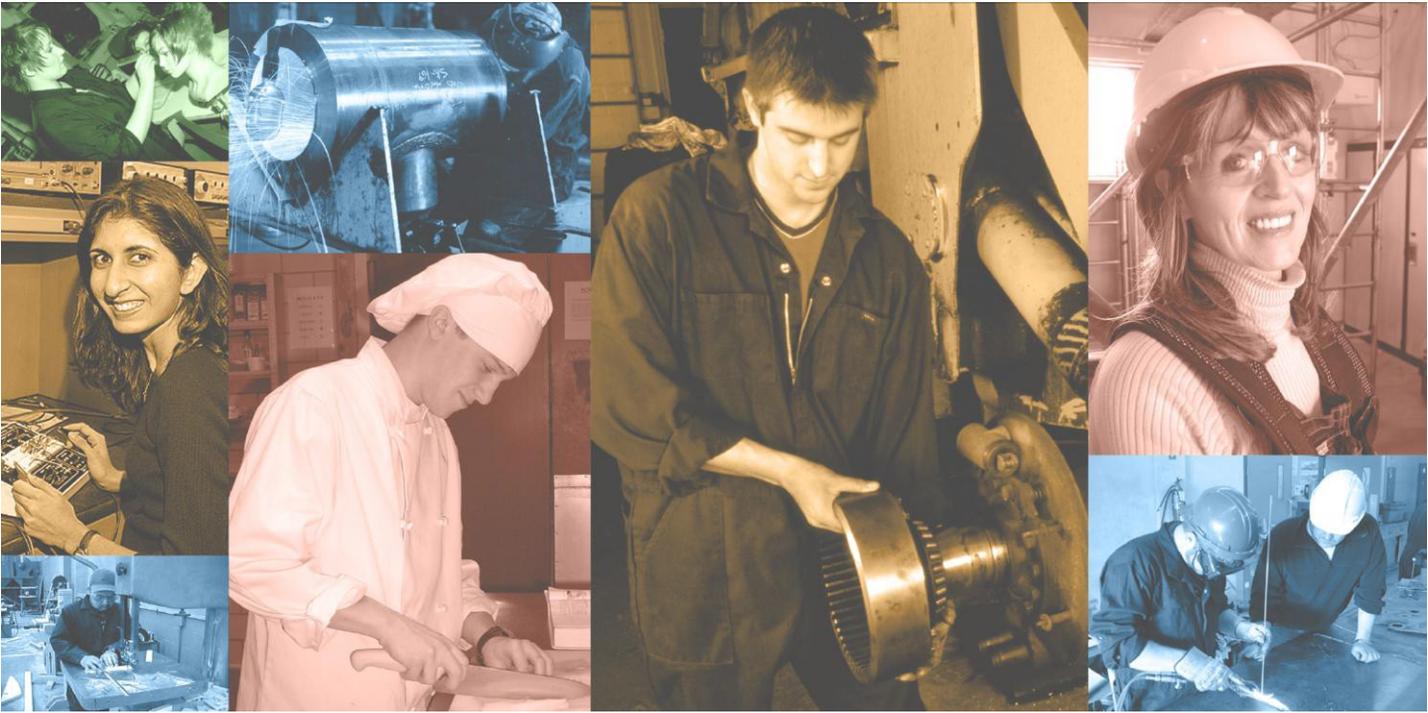

Plan of Training

PLUMBER



Government of Newfoundland and Labrador
Department of Advanced Education Skills and Labour
Apprenticeship and Trades Certification Division

March 2017

PLAN OF TRAINING

Pre-employment

Plumber

March 2017



**Government of Newfoundland and Labrador
Department of Advanced Education, Skills and Labour
Apprenticeship and Trades Certification Division**

Approved by:

A handwritten signature in blue ink, appearing to read "Darrell J. ...", positioned above a horizontal line.

Chairperson, Provincial Apprenticeship and Certification Board

Date: March 30, 2017

Preface

This curriculum standard is aligned with the 2017 Atlantic Apprenticeship Curriculum Standard (AACS) and the 2016 Red Seal Occupational Standard (RSOS) for the Plumber trade. It describes the curriculum content for the Plumber pre-employment training program.

Acknowledgements

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

We offer you a sincere thank you.

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A. Transfer Matrix

2017 PROGRAM STRUCTURE			2011 PROGRAM STRUCTURE			Course Matrix	
2017 COURSE NUMBER	2017 COURSE TITLE	2017 COURSE HOURS	2011 COURSE NUMBER	2011 COURSE TITLE	2011 COURSE HOURS	MATRIXED (Y/N)	NOTES
--	--	--	PF2110	Aluminum Piping	9	NA	Removed from program; objectives covered in Specialized Piping in Level 2 of AACS.
PF1451	Hydronic Heating	69	PF1450	Hydronic Heating 1	60	Y	Hour change, name change, minor updates to wording in objectives.

B. Program Structure

For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.

The order of course delivery can be determined by the educational agency, as long as pre-requisite conditions are satisfied.

Upon completion of the pre-employment program, individuals may be required to complete other certifications (employer or job site specific) in order to gain employment.

Courses with an identified AACCS number are equivalent to Level 1 units (courses) in the AACCS.

Pre-Employment				
NL Course No.	AACCS Unit	Course Name	Hours	Pre-Requisite(s)
TS1510	PLB-100	Occupational Health and Safety	6	None
TS1520	PLB-100	WHMIS	6	None
TS1530	PLB-100	Standard First Aid	14	None
PF1020	PLB-100	Job Site Safety	9	None
PF1340	PLB-105	Tools and Equipment	75	PF1020
PF1370	PLB-110	Rigging	39	PF1340
	PLB-115			
PF1731	PLB-120	Introduction to Electric Welding	24	PF1340
PF1380	PLB-120	Introduction to Fuel Brazing and Cutting	45	PF1340
PF1390	--	Pipe and Tubing Fundamentals	15	PF1340
PF1425	PLB-125	Plastic Piping	75	PF1340
PF1410	PLB-130	Copper Piping	45	PF1340
PF1401	PLB-135	Steel Piping	60	PF1340
PF1610	PLB-140	Cast Iron Piping	18	PF1340
PF1620	--	Non-Metallic Piping	6	PF1340
PF1440	--	Piping Valves	30	None
PF1640	PLB-160	Hot and Cold Water Supply	30	PF1340

Pre-employment Plan of Training - Plumber

Pre-Employment				
NL Course No.	AACS Unit	Course Name	Hours	Pre-Requisite(s)
PF1630	PLB-160	Water Service	6	PF1340
PF1670	PLB-145	Residential Sanitary Drainage	60	PF1340
PF1680	PLB-145	Residential Venting	45	PF1340
PF1700	--	Commercial Drainage, Waste and Venting 1	21	PF1340,PF1680
PF1350	PLB-150	Blueprint 1 (Basic Residential)	30	None
PF1360	PLB-150	Blueprint 2 (Advanced Residential/Light Commercial)	30	PF1350
PF1650	--	Hot Water Storage Tanks and Heaters	18	PF1340
PF1710	--	Residential Appliances, Fixtures and Trim	30	PF-1340; PF-1350; PF-1360; PF-1630; PF-1640; PF-1650; PF-1660; PF-1680
PF1451	--	Hydronic Heating	69	PF1340
PF1660	--	Water Treatment Systems	6	PF1340
PF1691	--	Storm Systems	13	PF1340,PF1680
PF1720	--	Rural Waste Disposal	15	PF1340
AP1101	--	Introduction to Apprenticeship	15	None
*AM1100	--	Math Essentials	30	None
AM1260	--	Pipe Trade Math Fundamentals	30	AM1100
CM2160	PLB-155	Communication Essentials	45	None
SD1760	PLB-155	Workplace Essentials	45	None
MC1060	PLB-155	Computer Essentials	15	None
Total Hours			1020	

*A student who can meet the **Required Work Experience** can ACUPLACER® test may be exempted from AM1100 your training institution.

PRE-EMPLOYMENT

TS1510 Occupational Health and Safety

Learning Outcomes:

- Demonstrate knowledge of interpreting the Occupational Health and Safety Act, laws and regulations.
- Demonstrate knowledge of understanding the designated responsibilities within the laws and regulations such as the right to refuse dangerous work; and the importance of reporting accidents.
- Demonstrate knowledge of how to prevent accidents and illnesses.
- Demonstrate knowledge of how to improve health and safety conditions in the workplace.

Duration: 6 Hours

Pre-requisite(s): None

Objectives and Content:

1. Interpret the Occupational Health and Safety Act laws and regulations.
 - i. explain the scope of the act
 - application of the Act
 - Federal/Provincial jurisdictions
 - Canada Labour Code
 - rules and regulations
 - private home application
 - conformity of the Crown by the Act
2. Explain responsibilities under the Act and Regulations.
 - i. duties of employer, owner, contractors, sub-contractors, employees, and suppliers

3. Explain the purpose of joint health and safety committees.
 - i. formation of committee
 - ii. functions of committee
 - iii. legislated rights
 - iv. health and safety representation
 - v. reporting endangerment to health
 - vi. appropriate remedial action
 - vii. investigation of endangerment
 - viii. committee recommendation
 - ix. employer's responsibility in taking remedial action

4. Examine right to refuse dangerous work.
 - i. reasonable grounds for refusal
 - ii. reporting endangerment to health
 - iii. appropriate remedial action
 - iv. investigation of endangerment
 - v. committee recommendation
 - vi. employer's responsibility to take appropriate remedial action
 - vii. action taken when employee does not have reasonable grounds for refusing dangerous work
 - viii. employee's rights
 - ix. assigning another employee to perform duties
 - x. temporary reassignment of employee to perform other duties
 - xi. collective agreement influences
 - xii. wages and benefits

5. State examples of work situations where one might refuse work.

6. Describe discriminatory action.
 - i. Definition
 - ii. filing a complaint procedure
 - iii. allocated period of time a complaint can be filed with the Commission
 - iv. duties of an arbitrator under the Labour Relations Act
 - v. order in writing inclusion
 - vi. report to commission allocated period of time to request arbitrator to deal with the matter of the request
 - vii. notice of application
 - viii. failure to comply with the terms of an order
 - ix. order filed in the court

7. Explain duties of commission officers.
 - i. powers and duties of officers
 - ii. procedure for examinations and inspections
 - iii. orders given by officers orally or in writing
 - iv. specifications of an order given by an officer to owner of the place of employment, employer, contractor, sub-contractor, employee, or supplier
 - v. service of an order
 - vi. prohibition of persons towards an officer in the exercise of his/her power or duties
 - vii. rescinding of an order
 - viii. posting a copy of the order
 - ix. illegal removal of an order

8. Interpret appeals of others.
 - i. allocated period of time for appeal of an order
 - ii. person who may appeal order
 - iii. action taken by commission when person involved does not comply with the order
 - iv. enforcement of the order
 - v. notice of application
 - vi. rules of court

9. Explain the process for reporting of accidents.
 - i. application of act
 - ii. report procedure
 - iii. reporting notification of injury
 - iv. reporting accidental explosion or exposure
 - v. posting of act and regulations

Practical Requirements:

1. Conduct an interview with someone in your occupation on two or more aspects of the act and report results.

2. Conduct a safety inspection of shop area.

TS1520 Workplace Hazardous Materials Information System (WHMIS)

Learning Outcomes:

- Demonstrate knowledge of interpreting and applying the Workplace Hazardous Materials Information System (WHMIS) regulation under the Occupational Health and Safety Act.

Duration: 6 Hours

Pre-requisite(s): None

Objectives and Content:

1. Define WHMIS safety.
 - i. rational and key elements
 - ii. history and development of WHMIS
 - iii. WHMIS legislation
 - iv. WHMIS implementation program
 - v. definitions of legal and technical terms

2. Examine hazard identification and ingredient disclosure.
 - i. prohibited, restricted and controlled products
 - ii. classification and the application of WHMIS information requirements
 - iii. responsibilities for classification
 - the supplier
 - the employer
 - the worker - Classification: rules and criteria
 - information on classification
 - classes, divisions and subdivision in WHMIS
 - general rules for classification
 - class A - compressed gases
 - class B - flammable and combustible materials
 - class C - oxidizing material
 - class D - poisonous and infectious material
 - class E - corrosive material

- class F - dangerously reactive material
 - iv. products excluded from the application of WHMIS legislation
 - consumer products
 - explosives
 - cosmetics, drugs, foods and devices
 - pest control products
 - radioactive prescribed substances
 - wood or products made of wood
 - manufactured articles
 - tobacco or products of tobacco
 - hazardous wastes
 - products handled or transported pursuant to the Transportation of Dangerous Goods (TDG) Act
 - v. comparison of classification systems – WHMIS and TDG
 - vi. general comparison of classification categories
 - vii. detailed comparison of classified criteria
- 3. Explain labeling and other forms of warning.
 - i. definition of a WHMIS label
 - supplier label
 - workplace label
 - other means of identification
 - ii. responsibility for labels
 - supplier responsibility
 - employer responsibility
 - worker responsibility
 - iii. introduce label content, design and location
 - supplier labels
 - workplace labels
 - other means of identification
- 4. Introduce material safety data sheets (MSDS).
 - i. definition of a material safety data sheet
 - ii. purpose of the data sheet
 - iii. responsibility for the production and availability of data sheets
 - supplier responsibility
 - employer responsibility
 - workers responsibility

Practical Requirements:

1. Locate WHMIS label and interpret the information displayed.
2. Locate a MSDS sheet for a product used in the workplace and determine what personal protective equipment and other precautions are required when handling this product.

TS1530 Standard First Aid

Learning Outcomes:

- Demonstrate knowledge of recognizing situations requiring emergency action
- Demonstrate knowledge of making appropriate decisions concerning first aid

Duration: 14 Hours

Pre-requisite(s): None

Objectives and Content:

1. Complete a St. John Ambulance or Canadian Red Cross Standard First Aid Certificate course.

PF1020 Job Site Safety

Learning Outcomes:

- Demonstrate knowledge of safety equipment, its applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.
- Demonstrate knowledge of regulatory requirements pertaining to PPE and safety equipment.
- Demonstrate knowledge of regulations, applications and procedures for locking out equipment.

Duration: 9 Hours

Pre-requisite(s): None

2016 RSOS Reference:

- 1.01 Maintains safe work environment.
- 1.02 Uses personal protective equipment (PPE) and safety equipment.
- 1.03 Performs lock-out and tag-out procedures.
- 5.01 Uses communication techniques.

Objectives and Content:

1. Identify types of personal protective equipment (PPE) and clothing and describe their applications, limitations and procedures for use.
2. Describe the procedures used to care for, maintain and store PPE.
3. Identify hazards and describe safe work practices.
 - i. personal
 - ii. workplace
 - iii. electrical
 - iv. isolation and deenergizing procedures
 - v. tag out/lockout
 - vi. confined space

- vii. trenches
 - viii. fire
 - ix. heights
 - x. asbestos
 - xi. environment
4. Identify and describe workplace safety and health regulations and certification requirements.
- i. Federal
 - ii. Transportation of Dangerous Goods (TDG)
 - iii. provincial/territorial
5. Describe company or jurisdictional procedures for emergency response.
6. Describe components of professional conduct.

Practical Requirements

None

PF1340 Tools and Equipment

Learning Outcomes:

- Demonstrate knowledge of the care and safe use of tools and equipment.
- Demonstrate knowledge of tools and equipment, their applications, maintenance and procedures for use.

Duration: 75 Hours

Pre-requisite(s): None

2016 RSOS Reference:

2.01 Uses common tools and equipment.

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to the use of tools and equipment.
2. Identify training and certification required by AHJ related to the use of tools and equipment.
3. Describe general safety requirements for using tools.
 - i. guarding, shielding when using tools
 - ii. body positioning
 - iii. pinch points
4. Describe the properties of metals used in hand and power tools.
 - i. tool steels for wrenches
 - ii. tool steels for saws and blades

5. Explain terminology associated with metals used in hand and power tools.
 - i. oxidation
 - ii. corrosion
 - iii. tensile strength
 - iv. shear strength

6. Identify types measuring tools and describe their purpose, applications, safe use and care.
 - i. tapes, rules, scale rules, straight edges
 - ii. calipers, micrometers, gauges
 - iii. plumb bobs, squares and levels
 - iv. torque wrench
 - v. scribes, markers, dividers and compasses

7. Identify types of hand tools and describe their purpose, applications, safe use and care.
 - i. punches, chisels, files and saws
 - ii. twist drills and drill bits
 - iii. hacksaws
 - iv. files
 - v. chisels
 - vi. hammers
 - vii. pliers
 - viii. pipe wrenches

8. Identify types of cutting, drilling and reaming tools and describe their applications and procedures for use.
 - i. snips and shears
 - ii. drills and reamers
 - iii. bolt cutters

9. Identify types of threading devices and describe their purpose, applications, safe use and care.
 - i. threading tools
 - ii. internal thread
 - iii. external thread
 - iv. tap and drill charts
 - v. bolt and pipe threads

10. Identify types of power tools and describe their purpose, applications, safe use and care.
 - i. portable power tools
 - ii. threading machines
 - iii. reaming tools
 - iv. core drill

11. Identify types of grinding tools and describe their purpose, applications, safe use and care.
 - i. portable and stationary grinders
 - ii. grinding and cutting wheels
 - iii. grinding discs
 - iv. grinder dressers
 - v. rotary wire brushes
 - vi. specialty flapper wheels
 - vii. rotary files

12. Identify types of drills and their accessories and describe their purpose, applications, safe use and care.
 - i. sizes and speed requirements
 - ii. power drilling equipment (hammer and portable drill)
 - iii. cutting fluids
 - iv. clamping devices
 - v. drill presses
 - vi. portable drills
 - vii. hot tap

13. Identify the tools used to cut metals and describe the procedures for their use.
 - i. saws
 - ii. power operated saws
 - iii. friction cut-off equipment
 - iv. shears
 - v. metal cutting power tools
 - vi. abrasives and blades

14. Identify shop equipment and hydraulic tools and describe their purpose, applications, safe use and care.
 - i. jacks
 - ii. shop cranes
 - iii. chain hoists

- iv. solvent cleaning tanks
 - v. pullers, drivers and presses
 - vi. hydraulic benders
 - vii. pipe positioners
15. Identify types of power actuated tools and describe their applications.
- i. describe the procedures used to inspect, maintain and store power actuated tools

Practical Requirements:

- 1. Use and maintain gripping and turning tools, measuring devices and levels.
- 2. Use and maintain various types of hand tools.
- 3. Use and maintain various types of power tools.
- 4. Use and maintain various types of threading devices.
- 5. Use and maintain various types of grinding tools.
- 6. Use and maintain various types of power operated cutting tools.
- 7. Use and maintain various types of shop equipment.

PF1370 Rigging

Learning Outcomes:

- Demonstrate knowledge of safe operating procedures for slings, cables and cranes.
- Demonstrate knowledge of the procedures to select rigging and lifting equipment using rigging charts and manuals as well as rule of thumb methods.
- Demonstrate knowledge of hoisting, lifting, positioning and rigging equipment, their applications, limitations and procedures for use and storage.
- Demonstrate knowledge of calculations required when performing hoisting and lifting operations.
- Demonstrate knowledge of the procedures used to perform hoisting, lifting and positioning operations.
- Demonstrate knowledge of inspection for rigging, hoisting, lifting and positioning equipment.
- Demonstrate knowledge of ladders, scaffolding and motorized work platforms, their applications, limitations and procedures for use

Duration: 39 Hours

Pre-requisite(s): None

2015 RSOS Reference:

- 2.02 Uses access equipment.
- 2.03 Uses rigging, hoisting, lifting and positioning equipment.
- 2.04 Rigs loads for cranes.

Objectives and Content:

1. Identify the Occupational Health and Safety Regulations for rigging.
2. Describe responsibilities and liabilities in the use of rigging, lifting and hoisting equipment.

3. Identify types of fibre ropes and describe their care, inspection and related safety procedures.
 - i. types
 - natural fibre
 - synthetic fibre
 - ii. considerations for selection and use
4. Describe kinds of knots, hitches and bends and their applications.
5. Explain angle considerations when using rigging.
 - i. rigging charts
 - ii. rule of thumb formulas
 - iii. compensation for angles in lifting of loads
6. Identify types of wire rope and accessories and describe their care, inspection and safety considerations for use.
 - i. construction
 - ii. clips and attachments
 - iii. slings and end rigging
 - iv. measurement
 - v. clamps and rigging
 - vi. splicing
 - vii. shackles and turnbuckles
7. Describe synthetic sling types, their characteristics, applications and limitations.
 - i. polyethylene slings
 - ii. polyester slings
 - iii. nylon slings
 - iv. mylar
 - v. kevlar
8. Describe chains and chain slings, their characteristics, applications and limitations.
9. Identify types of scaffolds and describe their characteristics and applications.
 - i. tube and clamp
 - ii. manufactured platforms and scaffolding
 - iii. suspended scaffolding

10. List safety rules for erecting and working on scaffolding.
 - i. kickplates
 - ii. braces
 - iii. ties
 - iv. planking
 - v. permits
 - vi. tagging
11. Describe special problems of rolling and suspended scaffolding and safety guidelines for their use.
12. Identify types of ladders and describe their applications and safety factors to be considered.
13. Identify types of motorized work platforms/hydraulic lifts and describe their characteristics and applications.
14. Describe procedures prior to and during the movement of objects with rigging equipment.
15. Identify jacks and describe their applications and procedures for use.
16. Identify methods of communications.
 - i. hand signals
 - ii. two-way radios
17. Identify types of cranes used in rigging.
 - i. mobile
 - ii. boom truck
 - iii. overhead

Practical Requirements:

1. Assemble knots, bends and hitches.
2. Use various types of slings and related equipment.
3. Erect scaffolding and use as work platforms.
4. Use various types of ladders.
5. Set up rigging equipment to perform a safe lift.

PF1731 Introduction to Electric Welding

Learning Outcomes:

- Demonstrate knowledge of electrically operated welding and cutting equipment and associated safety procedures.
- Demonstrate knowledge of welding equipment, applications and procedures for not-pressure and non-structural welds.

Duration: 24 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

2.05 Uses welding equipment.

Objectives and Content:

1. Explain the terminology associated with electric welding methods.
2. Identify hazards and safety practices pertaining to welding.
3. Describe types of welding and their applications.
 - i. SMAW
4. Identify welding consumables.
5. Explain the safe handling requirements used when handling shielding gas cylinders.
 - i. transportation
 - ii. storage
6. Describe electric welding equipment, its operating principles and components.
 - i. AC/DC rectifiers
7. Describe the basic classifications and applications of electrodes.

8. Describe procedures used to prepare for electric welding operations.
 - i. electrode selection
 - ii. current
 - iii. polarity settings
 - iv. special applications
9. Describe the safety procedures required in electric welding processes.
10. Explain stress relief of piping materials.
 - i. methods used to normalize materials after welding
11. Describe the procedures used to inspect, maintain and store welding equipment and consumables.

Practical Requirements:

1. Set up welding equipment.
2. Weld basic joint configurations using various electrodes.

PF1380 Introduction to Fuel Brazing and Cutting

Learning Outcomes:

- Demonstrate knowledge of soldering and brazing equipment, applications and procedures.
- Demonstrate knowledge of disarming the work area location within the fire monitoring system.
- Demonstrate knowledge of oxy-fuel equipment, applications and procedures.

Duration: 45 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 2.06 Uses soldering and brazing equipment.
- 2.07 Uses oxy-fuel equipment.

Objectives and Content:

Safety and Equipment

1. Identify types of heating/cutting equipment and describe their applications and procedures for use.
 - i. air-propane equipment
 - ii. air-acetylene system
 - iii. oxy-acetylene system
 - iv. oxy-propane
 - v. accessories and related equipment
 - vi. lighting and adjusting operations
 - vii. shut down

2. Describe the possible hazards of using heating/cutting equipment and procedures.
 - i. burns
 - ii. fires
 - iii. explosions
 - iv. injuries
 - v. fumes

3. Describe safety practices for use in brazing and cutting operations.
 - i. clothing
 - ii. location
 - iii. protective equipment
 - iv. work permits

4. Describe heating/cutting equipment and accessories, their components, purpose and characteristics.
 - i. cylinders
 - ii. gas
 - iii. regulators
 - iv. flashback arrestor
 - v. gauges
 - vi. hoses and connections
 - clamps,
 - y-connecters,
 - coupler-T
 - vii. fibre washers
 - viii. equipment wrench
 - ix. torches
 - x. mixer
 - xi. tips
 - xii. cutting attachment

5. Describe the use and care of oxygen cylinders.
 - i. characteristics of oxygen
 - ii. cylinder components and capacity
 - iii. storage and safety considerations
 - iv. individual cylinder
 - v. bulk packs

6. Describe the use and care of acetylene and propane cylinders.
 - i. characteristics of acetylene and propane
 - ii. cylinder components and capacity
 - iii. storage and safety considerations
 - iv. individual cylinder
 - v. bulk packs
7. Describe the types of cylinder trucks and lifting cages.
8. Describe the procedures for assembling, testing, lighting and shutting down heating/cutting equipment.
9. Explain the procedure on how to isolate specific area of the fire monitoring system.
10. Identify flush and purge procedures required for soldering and brazing

Brazing

11. Describe the principles of the brazing process and the differences between welding and brazing.
12. Describe fluxes, their applications and procedures for use.
 - i. soldering, brazing fluxes
 - ii. components and classifications of brazing fluxes
13. Describe the brazing process as applied to various metals.
14. Describe the flame adjustment for brazing various materials.
15. Describe the considerations, preparation, process and precautions used to produce various types of joints.
 - i. face feed brazed joints
 - ii. pre-inserted ring joints

Cutting

16. List metals that can be cut using oxy-fuel equipment.
17. Describe the various styles and designs of standard cutting torches.

18. Describe the various cutting tips, their care and maintenance.
 - i. sizes, styles and indexing
 - ii. accessories and tip cleaners

19. Describe the various types of cutting flames and procedures used for flame adjustment.
 - i. oxidizing
 - ii. carburizing
 - iii. neutral

20. Describe cutting procedures.
 - i. free hand
 - ii. straight edge

Practical Requirements:

1. Set-up, test, use and shut down heating/cutting equipment.
2. Perform various types of cuts.
3. Perform various brazing processes.

PF1390 Pipe and Tubing Fundamentals

Learning Outcomes:

- Demonstrate knowledge of the types of piping systems and their characteristics.
- Demonstrate knowledge of the materials used in the construction and installation of pipe and piping systems.

Duration: 15 Hours

Pre-requisite(s): PF1340

Objectives and Content:

1. Identify types of pipe, tube, tubing and describe their applications.
 - i. steel
 - ii. plastic
 - iii. copper
 - iv. brass
 - v. aluminum
 - vi. cast iron
 - ductile
 - duriron
 - grey
 - vii. historic
 - viii. glass
 - ix. asbestos-cement
 - x. reinforced concrete
 - xi. stainless steel
 - xii. fiberglass

2. Identify the types of piping and tubing systems.
 - i. potable/non-potable water supply
 - ii. sanitary drainage, waste and vent systems
 - iii. storm drainage systems
 - iv. heating systems
 - v. sprinkler systems

- vi. gas systems (fuel, medical)
 - vii. process and power generating systems
3. Identify pipe and tubing sizes.
- i. dimensions
 - ii. lengths
 - iii. wall thickness/schedule
4. Describe the terms ferrous and non-ferrous and their significance to the trade.
5. Describe the forces that act on piping systems.
- i. thermal expansion and contraction
 - ii. weight
 - iii. electrolysis
 - iv. friction loss
 - v. turbulence
 - vi. galvanic action
 - vii. environmental
6. Describe the types of sealants used in the trade and their applications.
- i. thread compounds
 - ii. gaskets
 - iii. packing
 - iv. cements/glue

Practical Requirements:

None

PF1425 Plastic Piping

Learning Outcomes:

- Demonstrate knowledge of plastic pipe and fittings and their assembly.
- Demonstrate knowledge of codes, standards and manufacturer's literature.
- Demonstrate knowledge of the procedures used to cut and join plastic pipe and tubing.

Duration: 75 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 4.02 Calculates pipe, tube and tube lengths
- 4.03 Calculates piping offsets
- 4.04 Installs piping supports
- 4.05 Installs sleeves
- 4.07 Commissions systems
- 6.01 Inspects tube, tubing, pipe and fittings before installation
- 6.02 Cuts tube, tubing and pipe
- 6.03 Bends tube, tubing and pipe
- 6.04 Prepares tube, tubing and pipe connections
- 7.02 Joins plastic pipe and tubing.

Objectives and Content:

1. Define terminology associated with plastic pipe and tubing.
2. Interpret codes and regulations pertaining to plastic pipe and tubing.
3. Interpret information pertaining to plastic pipe and tubing found on drawings and specifications.
4. Identify hazards and describe safe work practices pertaining to plastic pipe and tubing.

5. Identify types of plastics and describe their characteristics and applications.
 - i. thermoplastics
 - ii. thermosetting plastics

6. Identify the types of plastic piping, their properties and applications.
 - i. ABS (Acrylonitrile-Butadiene-Styrene)
 - ii. CPVC (Chlorinated Polyvinyl Chloride)
 - iii. PE (Polyethylene)
 - iv. PP (Polypropylene)
 - v. PVC (Polyvinyl Chloride)
 - vi. PEX (Cross-linked Polyethylene)
 - vii. with/without oxygen barrier
 - viii. PTFE (Teflon)
 - ix. PEX/Aluminum/PEX

7. Describe the labelling system used to identify plastic pipe and fittings.

8. Identify tools used to cut and prepare plastic pipe and describe the procedures for their use.
 - i. tube cutter
 - ii. file
 - iii. chop saw
 - iv. hacksaw
 - v. handsaw
 - vi. tube coiler
 - vii. deburring tool

9. Describe methods used to join plastic pipe and describe their associated procedures.
 - i. solvent weld
 - ii. fusion weld
 - iii. plastic welding
 - iv. thread
 - v. compression
 - vi. flare
 - vii. mechanical joint
 - viii. insert
 - ix. crimp

10. Identify types of fittings used for joining the various types of plastic pipe and describe their characteristics and applications.
 - i. terminology
 - ii. types
 - iii. parts
 - iv. acronyms and abbreviations

11. Identify and describe the tools and procedures used to hang, support and fasten plastic pipe and fittings.
 - i. codes
 - ii. specifications
 - iii. grade
 - iv. components
 - v. fire stopping systems

12. Identify adaptors required for transitions.

13. Describe the procedures used to calculate fitting allowances.
 - i. tees
 - ii. elbows
 - iii. 45 degrees

Practical Requirements:

1. Measure, cut and prepare various types of plastic pipe.

2. Assemble various types of plastic pipe by the following methods.
 - i. solvent weld
 - ii. thread
 - iii. compression
 - iv. mechanical joint
 - v. insert
 - vi. crimp

PF1410 Copper Piping

Learning Outcomes:

- Demonstrate knowledge of codes, standards and manufacturer's literature.
- Demonstrate knowledge of copper tube, tubing and pipe, and associated fittings and accessories.
- Demonstrate knowledge of the procedures used to cut and join copper tube, tubing and pipe.

Duration: 45 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 7.01 Joins copper tube, tubing and pipe.
- 4.02 Calculates pipe, tube and tube lengths
- 4.03 Calculates piping offsets
- 4.04 Installs piping supports
- 4.05 Installs sleeves
- 4.07 Commissions systems
- 6.01 Inspects tube, tubing, pipe and fittings before installation
- 6.02 Cuts tube, tubing and pipe
- 6.03 Bends tube, tubing and pipe
- 6.04 Prepares tube, tubing and pipe connections

Objectives and Content:

1. Define terminology associated with copper tube, tubing and pipe.
2. Identify hazards and describe safe work practices pertaining to copper tube, tubing and pipe.
3. Interpret codes, regulations and standards pertaining to copper tube, tubing and pipe.

4. Identify adaptors required to join dissimilar materials to prevent galvanic action.
5. Describe the properties and applications of copper pipe and fittings, and describe the methods and colors used to identify the following associated systems:
 - i. underground water service
 - ii. domestic hot and cold water systems
 - iii. drainage, waste and vent systems
 - iv. hot water heating systems
 - v. medical gas systems
 - vi. refrigeration systems
 - vii. compressed air
6. Identify the systems and criteria used in referencing, selecting and ordering copper tube and tubing.
 - i. size
 - ii. I.D./O.D. dimension standards
 - iii. length
 - iv. type
 - heating (H)
 - K
 - L
 - M
 - drainage, waste and vent (DWV)
 - Medical Gas
 - air conditioning and refrigeration (ACR)
 - gas (G)
 - general purpose (GP)
 - v. color coding (white, green, blue, red, yellow)
7. Describe the tools and procedures used to cut and prepare copper pipe.
 - i. tube cutter
 - ii. reamer
 - iii. cut off saw
 - iv. chop saw
 - v. hacksaw
8. Describe the tools and procedures used to join copper pipe.
 - i. solder/braze
 - ii. compression
 - iii. grooved

- iv. swaged
 - v. flared
 - vi. press fit
 - vii. crimped
9. Describe the tools and procedures used for soldering, bending and annealing copper pipe and fittings.
10. Identify fittings used for joining copper pipe and describe their characteristics and applications.
- i. terminology
 - ii. types
 - iii. parts
 - iv. acronyms and abbreviations
11. Identify and describe the tools and procedures used to hang, support and fasten copper pipe and fittings.
- i. codes
 - ii. specifications
 - iii. grade
 - iv. components
 - v. fire stopping systems
12. Describe the procedures used to calculate fitting allowances.
- i. tees
 - ii. elbows
 - iii. 45 degrees
13. Identify brass pipe and fittings and describe their properties and applications.
14. Describe methods used to cut and prepare brass pipe and their associated procedures.

Practical Requirements:

1. Measure, cut and prepare various types of copper pipe.
2. Assemble various types of copper pipe and tubing by the following methods.
 - i. solder
 - ii. braze
 - iii. compression
 - iv. swaged
 - v. grooved
 - vi. flaring
3. Bend copper tubing using tube benders.
4. Perform various types of pressure testing.

PF1401 Steel Piping

Learning Outcomes:

- Demonstrate knowledge of steel pipe and fittings and their assembly.
- Demonstrate knowledge of codes, standards and manufacturer's literature.
- Demonstrate knowledge of the procedures used to cut and join steel piping.

Duration: 60 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 4.02 Calculates pipe, tube and tube lengths
- 4.03 Calculates piping offsets
- 4.04 Installs piping supports
- 4.05 Installs sleeves
- 4.07 Commissions systems
- 6.01 Inspects tube, tubing, pipe and fittings before installation
- 6.02 Cuts tube, tubing and pipe
- 6.03 Bends tube, tubing and pipe
- 6.04 Prepares tube, tubing and pipe connections
- 7.03 Joins steel pipe.

Objectives and Content:

1. Define terminology associated with steel pipe.
2. Identify hazards and describe safe work practices pertaining to steel pipe.
3. Interpret codes, regulations and standards pertaining steel pipe.
4. Interpret information pertaining to steel pipe found on drawings and specifications.
5. Identify adaptors required to join dissimilar materials to prevent galvanic action.

6. List the properties and applications of steel pipe and fittings.
7. Identify steel piping systems.
 - i. heating systems
 - ii. cooling systems
 - iii. drainage, waste and vent systems
 - iv. compressed air systems
 - v. fuel oil/gas systems
 - vi. steam, humidification systems
 - vii. industrial, marine, food processing
8. List the types of steel piping, their characteristics and applications.
 - i. galvanized
 - ii. stainless
 - iii. cast iron
9. List the information required to select and order steel pipe.
 - i. material (steel, galvanized, stainless)
 - ii. size (diameter, length, standard lengths)
 - iii. schedule (wall thickness, grade)
 - iv. characteristics (welded, seamless)
 - v. end finishes (plain end, thread, grooved, beveled)
10. Identify the tools and methods used for cutting steel, galvanized and stainless steel pipe.
 - i. pipe cutters, reamers
 - ii. cut-off saw
 - iii. oxy-acetylene pipe beveller
 - iv. plasma arc cutter
 - v. angle grinder
 - vi. carbon arc cutter
11. Identify the methods of joining steel, galvanized and stainless steel pipe and describe their associated procedures.
 - i. threading and grooving
 - ii. welding
 - iii. flanging
 - iv. press-fit

12. Identify the tools used to prepare and assemble steel, galvanized and stainless steel pipe and describe procedures for their use.
 - i. hand and power threaders
 - ii. hand and power roll groovers
 - iii. cut groovers
 - iv. welding and cutting equipment
 - v. oxy/acetylene
 - vi. electric
 - vii. mig/tig
 - viii. press-fit crimper
 - ix. vice, wrenches
 - x. beveller

13. Identify fittings used to assemble steel, galvanized and stainless steel pipe and describe their characteristics and applications.
 - i. terminology
 - ii. types
 - iii. parts
 - iv. abbreviations

14. Identify and describe the tools and procedures used to hang and support steel pipe and fittings.
 - i. code
 - ii. specifications
 - iii. grade
 - iv. components
 - v. fire stopping systems

15. Describe an angle and its parts.
 - i. vertex
 - ii. degrees
 - iii. letters

16. Describe a circle and its parts.
 - i. centre
 - ii. circumference
 - iii. diameter
 - iv. radius
 - v. cord
 - vi. arc
 - vii. concentric and eccentric circle

17. Describe pipe measurement terms and their use.
 - i. end to end
 - ii. end to centre
 - iii. centre to centre
 - iv. back to back
 - v. centre to back
 - vi. centre to throat
 - vii. face to face
 - viii. overall

18. Calculate the perimeter and areas of:
 - i. squares
 - ii. rectangles
 - iii. triangles
 - iv. circles

19. Calculate the volume of:
 - i. cubes
 - ii. rectangular prisms and cylinders

20. Explain the Metric and Imperial systems and its use in the building trades.
 - i. length
 - ii. area
 - iii. volume
 - iv. temperature
 - v. pressure
 - vi. mass

21. Calculate piping measurements.
 - i. run and branch
 - ii. fitting allowance

- iii. center
 - iv. face
 - v. back
 - vi. throat
22. Calculate piping measurements with various degree fittings.
- i. diagonal
 - ii. offset
 - iii. travel
 - iv. rise and run
 - v. factors
23. Perform piping calculations using:
- i. grade
 - ii. drop
 - iii. rise and run
24. Identify and describe methods of pipe bending.
- i. calculations
 - ii. bend locations
 - iii. determine gain
 - iv. determine length of bend
 - v. determine angle

Practical Requirements:

1. Measure, cut and prepare various types of ferrous pipe.
2. Assemble various types of ferrous pipe by the following methods.
 - i. thread
 - ii. groove
 - iii. bevel
 - iv. flange
 - v. tack-weld
 - vi. mechanical
3. Bend steel pipe using hydraulic benders.
4. Perform various types of pressure testing.

PF1610 Cast Iron Piping

Learning Outcomes:

- Demonstrate knowledge of cast iron pipe and fittings and their assembly.
- Demonstrate knowledge of codes and standards.
- Demonstrate knowledge of the procedures used to cut and join cast iron piping

Duration: 18 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 4.02 Calculates pipe, tube and tube lengths
- 4.03 Calculates piping offsets
- 4.04 Installs piping supports
- 4.05 Installs sleeves
- 4.07 Commissions systems
- 6.01 Inspects tube, tubing, pipe and fittings before installation
- 6.02 Cuts tube, tubing and pipe
- 6.04 Prepares tube, tubing and pipe connections
- 7.04 Joins cast iron pipe.

Objectives and Content:

1. Define terminology associated with cast iron piping.
2. Identify hazards and describe safe work practices pertaining to cast iron piping.
3. Identify types of cast iron piping and describe their properties and characteristics.
4. Identify and interpret applicable sections of the National Plumbing Code.

5. Describe the properties and applications of cast iron pipe and fittings.
 - i. drainage
 - ii. waste
 - iii. vent
 - iv. potable water

6. Identify the systems and criteria used in referencing, selecting and ordering cast iron and duriron soil pipe.
 - i. diameter
 - ii. length
 - iii. end finishes

7. List the information required to select and order cast iron water pipe.
 - i. material (ductile)
 - ii. diameter
 - iii. length
 - iv. schedule - wall thickness, schedule or grade
 - v. end finishes - plain end, cut grooved

8. Explain the tools and procedures used to cut cast iron soil pipe.
 - i. snap cutters
 - ii. cut off saw
 - iii. chop saw
 - iv. hacksaw
 - v. hammer/chisel

9. Describe the tools and procedures used to cut ductile and duriron pipe.
 - i. cut off saw
 - ii. chop saw
 - iii. hydraulic pipe cutters

10. Describe the tools used to join cast iron soil pipe, ductile and duriron pipe.
 - i. bi-seal puller
 - ii. torque and hand wrenches

11. Explain the methods of joining cast iron soil pipe, ductile and duriron pipe.
 - i. caulked joint
 - ii. mechanical joint
 - iii. bi-seal

12. Identify the fittings used for joining cast iron soil pipe, ductile and duriron pipe and describe their characteristics and applications.
 - i. terminology
 - ii. types
 - iii. parts
 - iv. acronyms and abbreviations

13. Identify and describe the tools and procedures used to hang, support, and fasten cast iron pipe and fittings.
 - i. plumbing codes
 - ii. specifications
 - iii. grade
 - iv. components
 - v. fire stopping systems

Practical Requirements:

1. Measure, cut, and install cast iron pipe.
 - i. mechanical joint
 - ii. bi-seal
 - iii. cold caulking

PF1620 Non-Metallic Piping

Learning Outcomes:

- Demonstrate knowledge of non-metallic piping and fittings and their assembly.
- Demonstrate knowledge of how to carry out work in compliance with codes and standards.

Duration: 6 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 4.02 Calculates pipe, tube and tube lengths
- 4.03 Calculates piping offsets
- 4.04 Installs piping supports
- 4.05 Installs sleeves
- 4.07 Commissions systems
- 6.01 Inspects tube, tubing, pipe and fittings before installation
- 6.02 Cuts tube, tubing and pipe
- 6.03 Bends tube, tubing and pipe
- 6.04 Prepares tube, tubing and pipe connections
- 7.05 Joins specialized pipe.

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify types of non-metallic piping and describe their properties and applications.
 - i. glass
 - ii. concrete
3. Explain the tools and methods used to cut and join glass pipe.

4. Identify the types of fittings used for joining glass pipe and describe their characteristics and applications.
 - i. terminology
 - ii. types
 - iii. parts
 - iv. abbreviations and acronyms

5. Describe the methods and tools used to hang, support, and fasten glass pipe and fittings.
 - i. specifications
 - ii. grade
 - iii. components
 - iv. firestopping systems

6. Identify the applications of concrete pipe and codes references.

Practical Requirements:

None

PF1440 Piping Valves

Learning Outcomes:

- Demonstrate knowledge of piping valves and their installation.

Duration: 30 Hours

Pre-requisite(s): None

Objectives and Content:

1. Describe the materials and service ratings for valves.
2. Explain valve terminology.
3. Identify the principle types of valves and describe their purpose, design, components, operation and applications.
 - i. gate
 - ii. globe
 - iii. ball/plug
 - iv. butterfly (gear or lever)
 - v. check
 - vi. temperature / pressure relief
 - vii. pressure reducing
 - viii. float operated
 - ix. diaphragm
 - x. mixing
 - xi. pop safety valve
4. Describe procedures used to install valves.
 - i. position
 - ii. location
 - iii. accessibility
 - iv. joining methods

5. Describe the types, construction and operation of control valves.
 - i. two-way
 - ii. three-way
 - iii. actuated

6. Describe the care and maintenance of valves.
 - i. disassembly/reassembly
 - ii. replacement of parts
 - iii. re-packing
 - iv. tools

Practical Requirements:

1. Install various types of valves.

PF1640 Hot and Cold Water Supply

Learning Outcomes:

- Demonstrate understanding of procedures used to rough-in and install hot and cold water systems.
- Demonstrate knowledge of how to install piping systems for potable and non-potable water supplies.

Duration: 30 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 11.01 Sizes pipe for water services
- 11.02 Installs piping for water services
- 11.03 Installs water service equipment
- 11.04 Tests water service piping and components
- 11.05 Services water services
- 12.01 Sizes piping and equipment for potable water distribution systems
- 12.02 Installs piping for potable water distribution systems
- 12.03 Installs potable water distribution equipment
- 12.04 Installs and uses cross-connection control devices and methods
- 12.05 Tests potable water distribution systems
- 12.06 Services potable water distribution systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Explain the term “roughing-in”.
 - i. considerations
 - ii. importance of code
3. Describe procedures used to lay out the locations of fixtures and piping.

4. Describe procedures used to rough-in and install hot and cold water piping.
 - i. valves
 - ii. shock absorbers
 - iii. air chambers
 - iv. recirculating lines and pumps
 - v. connections to hot water storage tanks
 - vi. piping fabrication and testing

5. Describe the procedures used to layout and install water supply lines.
 - i. water distribution system
 - ii. typical installation
 - iii. definitions
 - iv. expansion of hot water lines
 - v. installation methods and procedures
 - vi. considerations
 - vii. types of pipes and fittings
 - viii. types of solder
 - ix. location and types of valves (access panels)
 - x. purpose and types of insulation
 - xi. location and size of sleeving
 - xii. pressure reducing valves
 - xiii. booster pumps
 - xiv. trap primers (cross connections)
 - xv. hangers
 - xvi. frost protection

6. Describe the purpose and installation of recirculating lines.
 - i. gravity circulation
 - ii. forced circulation
 - iii. piping arrangements
 - iv. circulating pumps

7. Describe the procedures used to install supports.
 - i. considerations
 - ii. materials
 - iii. code information
 - iv. types of hangers and supports

8. Describe the procedures used to install hose bibs and non-freeze hydrants.

9. Explain the term water hammer, its causes, problems and methods of controlling in a residential application.
 - i. air chambers
 - ii. water hammer arrestors
10. Describe procedures used for testing installations.
11. Describe the procedures used to size water supply systems.

Practical Requirements:

1. Size, install, test and maintain a potable hot and cold-water distribution system with each of the following materials.
 - i. pex
 - ii. copper
 - iii. pex- al-pex
 - iv. pe-al-pe
 - v. cpvc

PF1630 Water Service

Learning Outcomes:

- Demonstrate knowledge of how water supply equipment functions.
- Demonstrate knowledge of installing piping systems for potable and non-potable water supplies.

Duration: 6 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 11.01 Sizes pipe for water services
- 11.02 Installs piping for water services
- 11.03 Installs water service equipment
- 11.04 Tests water service piping and components
- 11.05 Services water services
- 12.01 Sizes piping and equipment for potable water distribution systems
- 12.02 Installs piping for potable water distribution systems
- 12.03 Installs potable water distribution equipment
- 12.04 Installs and uses cross-connection control devices and methods
- 12.05 Tests potable water distribution systems
- 12.06 Services potable water distribution systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe the procedures used to determine elevations and grades for water supply piping.
3. Describe the procedures used to lay out and shore trenches.

4. Describe the procedures used to make connections to curb stops.
 - i. service pipe
 - ii. main valves and water meters
5. Identify and interpret the National Plumbing Code sections that apply to the fabrication, application and testing of water service pipe.
6. Describe the procedures used to install water services to buildings.
 - i. purpose
 - ii. equipment and materials
 - iii. installation
 - iv. safety
 - v. plumbing requirements
7. Describe water service component parts and their applications.
 - i. water main
 - ii. corporation stop or cock
 - iii. curb stop
 - iv. meters
 - v. meter yoke
 - vi. by-pass
 - vii. strainers
 - viii. flow meters
 - ix. check valves
 - x. back flow preventers
8. Identify types of water meters and describe their purpose and operation.
 - i. types
 - ii. positive displacement
 - iii. turbine
 - iv. location
9. Identify and interpret code regulations pertaining to the installation of water meters.
10. Describe the procedures used to install water supply for outbuildings.
 - i. pumping system components
 - ii. tasks and uence
 - iii. piping practices

11. Describe gravity water supply systems.
 - i. classes
 - ii. with or without pump
 - iii. installation
12. Identify and interpret code regulations pertaining to the selection and installation of water pipes.
13. Describe the procedures used to determine water piping requirements and procedures.
 - i. drawings
 - ii. specifications
 - iii. manufacturer's literature
14. Interpret plumbing code requirements and define the requirements for support of piping.
15. Describe the procedures used to install supports.
 - i. elevations and grades
 - ii. trenches
 - iii. anchors, tie rods and thrust blocks
16. Describe the procedures used for supporting, anchoring, and rodding cold water pipe.
 - i. pipe protection
 - ii. freezing
 - iii. settling
 - iv. blowouts
 - v. blocking and rodding
 - vi. changes of direction
 - vii. backfilling
17. Describe the procedures used to install anchors, tie rods, thrust blocks and supports for water service.

Practical Requirements:

1. Install a corporation stop, curb stop, service box, and stop and drain valve.

PF1670 Residential Sanitary Drainage

Learning Outcomes:

- Demonstrate knowledge of DWV systems, their components, applications and operation
- Demonstrate knowledge of the procedures used to determine and transfer grade and elevation measurements for DWV systems
- Demonstrate of the procedures used to layout and install DWV systems.
- Demonstrate knowledge of testing equipment and procedures used for testing interior DWV systems.
- Demonstrate knowledge of interior drainage, waste and vent (DWV) system equipment and components, their applications and operation.
- Demonstrate knowledge of the procedures used to service interior DWV systems.
- Demonstrate knowledge of the procedures to install fire stopping devices and materials.

Duration: 60 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 4.01 Performs piping system layout.
- 4.06 Commissions systems.
- 4.07 Protects piping systems, equipment and structure from damage.
- 4.09 Installs fire stopping devices and materials.
- 10.01 Sizes pipe for interior drainage, waste and vent (DWV) systems.
- 10.02 Installs underground piping and components for interior drainage, waste and vent (DWV) systems.
- 10.03 Installs piping and components for interior drainage, waste and vent (DWV) systems above-ground.
- 10.04 Tests interior drainage, waste and vent (DWV) systems.
- 10.05 Services piping and components for interior drainage, waste and vent (DWV) systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. State the purpose and theory of drainage and venting systems.
 - i. health and sanitation
 - ii. liquids and water-borne waste
 - iii. circulation of air within plumbing system
 - iv. siphoning and back pressure
3. Identify types of building sewers, describe their characteristics and the methods and piping used in connection.
 - i. sanitary
 - ii. storm
 - iii. combined
4. Explain the methods of sizing the building sewer.
 - i. interpret code requirements
 - ii. determine hydraulic load (fixture units)
5. Describe the procedures for installing piping and services in trenches.
 - i. safety factors
 - ii. tools/equipment
 - iii. support
 - iv. protection
6. Describe the purpose of grading pipes.
 - i. waste
 - ii. vent
 - iii. heating
7. Describe the methods of calculating grade and percent of grade.
 - i. fall
 - ii. grade/percent of grade
 - iii. run

8. Describe the tools used for grading pipes.
 - i. level
 - ii. builders level/transit
 - iii. laser
 - iv. tape measure
9. Describe the procedures used to perform measurements and determine elevations on vertical pipe.
10. Define common terminology associated with residential drainage and waste systems.
11. Describe the components of a residential plumbing drainage system.
 - i. building drain
 - ii. branch
 - iii. stack
 - iv. fixture
 - v. fixture drain
 - vi. trap arm
 - vii. fixture outlet pipe
 - viii. clean-out
 - ix. floor drain
12. Describe the procedures used to rough-in a complete residential plumbing drainage system.
 - i. review drawings and specifications
 - ii. sizing, material list take off
 - iii. scheduling and planning
 - iv. excavation, cutting holes, installation, testing, inspection
13. Define the terms fixture unit and hydraulic load.
14. Identify types of common residential plumbing fixtures.
15. Describe the relationship of plumbing fixtures to the sizing of drainage and vent systems.
 - i. outlet size
 - ii. volume/capacity
 - iii. waste and water connections

16. Describe the angles of branches and bends in a drainage or venting system.
 - i. wye
 - ii. sanitary tee
 - iii. elbow/bend

17. Explain the methods of sizing the building drain.
 - i. interpret plumbing code requirements
 - ii. determine hydraulic load (fixture units)
 - iii. determine grade

18. Describe the procedures used to install the building drain.
 - i. location of fixtures/services
 - ii. material lists
 - iii. excavation
 - iv. installation/support
 - v. protection/identification
 - vi. testing and inspection

19. Describe the procedures used to size the soil or waste stack.
 - i. interpret plumbing code requirements
 - ii. determine hydraulic load (fixture units)

20. Describe the procedures used to install the soil or waste stack.
 - i. location of fixtures/services
 - ii. material lists
 - iii. interference
 - iv. locate and cut openings
 - v. installation/support
 - vi. testing and inspection

21. Describe procedures used to size fixture drains and branches.
 - i. interpret plumbing code requirements
 - ii. determine hydraulic load (fixture units)

22. Describe the methods of locating services and cutting/modifying structural members to rough-in plumbing systems.

23. Identify types of cleanouts and describe their purpose and applications.
 - i. type
 - ii. size
 - iii. location/accessibility
 - iv. interpret plumbing code requirements

24. Identify traps, trap seals, floor drains and describe their purpose and applications.
 - i. size
 - ii. type
 - iii. trap primers
 - iv. interpret plumbing code requirements

25. Describe the methods used in locating floor drains and cleanouts in slabs to achieve finished elevations.

26. Describe trap seal loss and how to prevent it.
 - i. siphonage
 - ii. back pressure
 - iii. capillary attraction
 - iv. interpret plumbing code requirements

27. Identify code requirements for and explain the acceptable methods of testing drainage systems.
 - i. underground drainage systems
 - ii. above ground drainage, waste and vent systems
 - iii. fixtures

28. Describe the methods of providing back flow protection for drainage systems.
 - i. back water valve
 - ii. plug
 - iii. gate valve

29. Describe the procedures used to perform material list take-off from plans.

30. Interpret plumbing code requirements and define the requirements for non-metallic pipe fittings.

31. Interpret plumbing code requirements and define the requirements for ferrous pipe and fittings.

32. Interpret plumbing code requirements and define the requirements for non-ferrous pipe and fittings.
33. Interpret plumbing code requirements and define the requirements for joints and connections.

Practical Requirements:

1. Size, install, test, maintain and repair a soil and waste residential drainage system (upstream of the building sewer).

PF1680 Residential Venting

Learning Outcomes:

- Demonstrate knowledge of DWV systems, their components, applications and operation
- Demonstrate knowledge of the procedures used to determine and transfer grade and elevation measurements for DWV systems
- Demonstrate of the procedures used to layout and install DWV systems.
- Demonstrate knowledge of testing equipment and procedures used for testing interior DWV systems.
- Demonstrate knowledge of interior drainage, waste and vent (DWV) system equipment and components, their applications and operation.
- Demonstrate knowledge of the procedures used to service interior DWV systems
- Demonstrate knowledge of the procedures to install fire stopping devices and materials.

Duration: 45 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 4.01 Performs piping system layout.
- 4.06 Commissions systems.
- 4.07 Protects piping systems, equipment and structure from damage.
- 4.09 Installs fire stopping devices and materials.
- 10.01 Sizes pipe for interior drainage, waste and vent (DWV) systems.
- 10.02 Installs underground piping and components for interior drainage, waste and vent (DWV) systems.
- 10.03 Installs piping and components for interior drainage, waste and vent (DWV) systems above-ground.
- 10.04 Tests interior drainage, waste and vent (DWV) systems.
- 10.05 Services piping and components for interior drainage, waste and vent (DWV) systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Define common terminology associated with residential venting systems.
3. Describe the possible elements of a residential plumbing venting system.
 - i. stack vent
 - ii. individual vent
 - iii. dual vent
 - iv. branch vent
 - v. header
 - vi. continuous vent
 - vii. wet vent (four fixtures or less)
4. Describe the procedures for installing the various residential vent systems.
 - i. material lists
 - ii. interference
 - iii. locate and cut openings
 - iv. installation/support
 - v. protection
 - vi. testing and inspection
5. Explain the methods of sizing a stack vent.
 - i. interpret plumbing code requirements
 - ii. determine hydraulic load (fixture units)
 - iii. determine developed length
6. Describe various types of individual vents, their characteristics and applications.
7. Explain the methods of sizing an individual vent.
 - i. interpret plumbing code requirements
 - ii. determine largest trap served
8. Explain the methods of sizing a dual vent.
 - i. interpret plumbing code requirements
 - ii. determine largest trap served

9. Explain the methods of sizing a branch vent.
 - i. hydraulic load (fixture units)
 - ii. developed length

10. Explain the methods of sizing a header.
 - i. interpret plumbing code requirements
 - ii. determine hydraulic load (fixture units)
 - iii. determine developed length

11. Explain the methods of sizing a continuous vent.
 - i. interpret plumbing code requirements
 - ii. determine size of trap
 - iii. determine hydraulic load (fixture units)
 - iv. determine developed length

12. Explain the methods of sizing wet vents (four fixtures or less).
 - i. interpret plumbing code requirements
 - ii. determine fixture type/trap sizes
 - iii. determine hydraulic load (fixture units)
 - iv. number of storeys
 - v. offset length

13. Describe vent terminals, their purpose and operating principles.
 - i. interpret plumbing code requirements
 - ii. frost protection
 - iii. flashing
 - iv. installation methods

Practical Requirements:

1. Size, install, test, maintain and repair a residential venting system.

PF1700 Commercial Drainage, Waste And Venting I

Learning Outcomes:

- Demonstrate knowledge of commercial sanitary drainage systems sewers, manholes, catch basins, their components, applications and operation.
- Demonstrate knowledge of testing equipment and procedures used for testing commercial sanitary drainage systems sewers, manholes and catch basins.
- Demonstrate knowledge of the procedures used to determine and transfer grade and elevation measurements for commercial sanitary drainage systems, sewers, manholes and catch basins
- Demonstrate knowledge of the procedures used to layout and install piping for commercial sanitary drainage systems, sewers, manholes and catch basins.
- Demonstrate knowledge of the procedures used to service repair and troubleshoot commercial sanitary drainage systems, sewers, manholes and catch basins

Duration: 21 Hours

Pre-requisite(s): PF1680, PF1340

2016 RSOS Reference:

- 4.01 Performs piping system layout.
- 4.06 Commissions systems.
- 4.07 Protects piping systems, equipment and structure from damage.
- 4.09 Installs fire stopping devices and materials.
- 10.01 Sizes pipe for interior drainage, waste and vent (DWV) systems.
- 10.02 Installs underground piping and components for interior drainage, waste and vent (DWV) systems.
- 10.03 Installs piping and components for interior drainage, waste and vent (DWV) systems above-ground.
- 10.04 Tests interior drainage, waste and vent (DWV) systems.
- 10.05 Services piping and components for interior drainage, waste and vent (DWV) systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify and interpret the National Plumbing Code sections which apply to the
 - i. fabrication, application and testing of interceptors.
3. Describe the tools, methods and procedures used to size and install a building sewer for a commercial complex.
 - i. tools used for grading pipes
 - ii. plumbing code requirements
 - iii. installing piping and services in trenches
4. Describe the procedures used to determine elevations and grades.
5. Describe the procedures used to size grease interceptors.
6. Describe the procedures used to lay out and install grease interceptors.
7. Describe the maintenance and cleaning of interceptors.
8. Describe the purpose, planning and installation of cleanouts and manholes in a commercial complex.
 - i. types, identification
 - ii. locations/spacing
 - iii. access and accessibility
 - iv. plumbing code requirements
9. Describe the types of traps used in plumbing systems, their purpose, components and applications.
10. Describe the various methods and systems of maintaining trap seals.
 - i. trap seal primers
 - ii. indirectly connected fixtures
 - iii. manual replenishment

11. Describe the various types of trap seal primers.
 - i. single and multiple distribution units
 - ii. electronic systems
 - iii. flush tanks
 - iv. individual fixtures

12. Explain floor drain terminology.
 - i. drain body
 - ii. receiver
 - iii. grate/strainer
 - iv. flashing collar/gasket
 - v. leveling screws
 - vi. primer connection
 - vii. floor sink
 - viii. flushing drain

13. Describe the procedures used to locate and install floor drains.
 - i. determine low point
 - ii. layout
 - iii. cut/sleeve openings
 - iv. installation/secure/protection
 - v. connection to piping

14. Explain the procedures for installing drains and vents for dishwashers and garbage grinders.

15. Describe the uencing and procedures used to rough-in a complete commercial plumbing drainage system.
 - i. review drawings and specifications
 - ii. sizing
 - iii. material list take off
 - iv. scheduling and planning
 - v. excavation, coring/sleeving
 - vi. installation, testing, inspection

Practical Requirements:

None

PF1350 Blueprint 1 (Basic Residential)

Learning Outcomes:

- Demonstrate knowledge of drawings and specifications.
- Demonstrate knowledge of various piping and equipment layouts and applications.
- Demonstrate knowledge of layout tools and equipment.

Duration: 30 Hours

Pre-requisite(s): None

2016 RSOS Reference:

- 4.01 Performs piping system layout.
- 3.01 Organizes project tasks and procedures.
- 3.02 Organizes materials and supplies.

Objectives and Content:

Fundamentals of Blueprint Reading

1. Describe types of drawings and sketches and their significance and use in the piping trades.
 - i. orthographic drawings (series of drawings make plan)
 - ii. isometric sketches
 - iii. single line sketches

2. Explain the importance of and procedures for proper care and handling of drawings.
 - i. plastic
 - ii. tape edges
 - iii. notes/changes
 - iv. filing/rolling
 - v. storage

3. Explain visualization and its' associated views.
 - i. vertical up/down
 - ii. horizontal side/side
 - iii. plan view
 - iv. elevation view
 - v. front, rear, left, right views

Architectural Drawing Symbols

4. Identify and interpret the common lines found on a residential blueprint.
 - i. center line
 - ii. hidden line
 - iii. cutting plane line
 - iv. break line
 - v. dimension line
 - vi. extension line
 - vii. object line
 - viii. leader line
5. Identify and interpret basic architectural symbols.
 - i. earth
 - ii. concrete
 - iii. block
 - iv. metal
 - v. structural steel
 - vi. wood
 - vii. gyproc over wood
 - viii. insulation
 - ix. windows, doors
6. Explain the terms "scale" and "dimension" and their use and location on drawings.
7. Identify and interpret the components of a sketch or drawing.
 - i. title block
 - ii. name
 - iii. address
 - iv. date
 - v. materials
 - vi. system

- vii. view
- viii. measurements
- ix. orientation
- x. north
- xi. elevation orientation
- xii. legibility
- xiii. revisions

Sketches and Symbols

- 8. Identify basic plumbing symbols.
 - i. water closet
 - ii. lavatory
 - iii. bathtub
 - iv. shower
 - v. kitchen sink
 - vi. laundry tub
 - vii. hot water tank
 - viii. water meter

- 9. Identify basic piping system symbols.
 - i. piping
 - ii. fittings
 - iii. valves
 - iv. pumps
 - v. drains (roof and floor)

- 10. Identify single line sketch symbols.
 - i. fittings
 - ii. facing viewer
 - iii. facing away
 - iv. horizontal
 - v. changes in direction
 - vi. valves, unions, reducers

- 11. Identify and interpret isometric drawings.
 - i. vertical lines
 - ii. angles relating to horizontal
 - iii. 45 degree angle
 - iv. floor penetrations

12. Identify and interpret roughing-in dimensions for residential piping fixtures.
 - i. manufactures literature
 - ii. rough-in books
 - iii. building codes
 - iv. barrier free requirements

Practical Requirements:

1. Interpret and sketch basic drawings and diagrams.

PF1360 Blueprint 2 (Advanced Residential/Light Commercial)

Learning Outcomes:

- Demonstrate knowledge of piping drawings in both orthographic and isometric views for advanced residential/commercial buildings.
- Demonstrate knowledge of single line sketches from advanced residential/commercial drawings and blueprints.
- Demonstrate knowledge of orthographic piping drawings to isometric drawings.
- Demonstrate knowledge of isometric piping drawings to orthographic drawings.
- Demonstrate knowledge of compass and elevations to advanced residential/commercial pipe drawings.
- Demonstrate knowledge of orthographic sketches for advanced residential/commercial installations.
- Demonstrate knowledge of architectural drawings for advanced residential/commercial installations.

Duration: 30 Hours

Pre-requisite(s): PF1350

2016 RSOS Reference:

- 4.01 Performs piping system layout.
- 3.01 Organizes project tasks and procedures.
- 3.02 Organizes materials and supplies.

Objectives and Content:

Architectural Drawings and Symbols

1. Describe divisions, their content, relationship and numbering systems.
 - i. architectural
 - ii. mechanical
 - iii. electrical

2. Describe plans, their content and use in job planning.
 - i. plot (site)
 - ii. foundation
 - iii. floor plans
 - basement
 - first floor
 - second (subsequent) floor plans
 - iv. exterior elevations
 - v. sections, details
 - vi. reflected ceiling drawings
 - vii. room finish schedules

3. Identify steps required in job planning.
 - i. job requirements
 - ii. work schedule
 - iii. access to work location
 - iv. worksite inspection
 - v. equipment and piping
 - vi. materials list

4. Identify features found on architectural drawings and describe their use.
 - i. grid lines
 - ii. exploded views
 - iii. sections
 - iv. details
 - v. finish schedule
 - vi. page references
 - vii. elevations
 - viii. architectural symbols

5. Explain the procedures used to determine accurate dimensions from a drawing, their purpose and importance.
 - i. how measurements are indicated (engineer vs. architect)
 - ii. start and finish
 - iii. wall locations
 - iv. pipe penetrations
 - v. use of scaling

6. Describe the purpose and importance of specifications.

Sketches and Symbols

7. Identify plumbing symbols and interpret rough-in dimensions found on a set of commercial drawings.
 - i. wall hung toilet
 - ii. wall hung lavatory
 - iii. wall hung urinal
 - iv. janitors sink
 - v. triple compartment sink
 - vi. drinking fountain
 - vii. grease interceptor
 - viii. bidets

8. Identify commercial piping system symbols and explain their importance and use.
 - i. piping
 - ii. building sewer
 - iii. building drain
 - iv. soil and waste stacks
 - v. fixture drains and branches
 - vi. venting
 - vii. domestic hot and cold
 - viii. re-circulation lines
 - ix. storm building drains and sewers
 - x. compressed air
 - xi. trap priming
 - xii. fittings
 - xiii. elbows
 - xiv. wye's
 - xv. tees
 - xvi. cleanouts
 - xvii. reducers
 - xviii. unions
 - xix. flanges
 - xx. valves
 - ball
 - check
 - gate
 - globe
 - backwater

- xxi. pressure reducing
 - trap primer
 - xxii. hangers and supports
 - xxiii. heating
 - piping
 - heating water supply
 - water return
 - anchors
 - guides
 - xxiv. heating equipment
 - xxv. boilers
 - xxvi. oil tanks
 - xxvii. radiation
 - xxviii. exchangers
 - xxix. expansion tanks
 - xxx. thermometers
 - xxxi. pressure gauges
 - xxxii. auto air vents
 - xxxiii. flex connections/loops
 - xxxiv. heating valves
 - circuit setters
 - flow control
 - pressure relief
 - control
 - 3-way
9. Identify basic welding symbols and explain their use.
10. Identify and interpret interference drawings.
- i. mechanical
 - ii. electrical
 - iii. architectural
 - iv. structural
11. Identify and interpret rough-in dimensions for commercial piping fixtures.
- i. manufactures literature
 - ii. rough-in books
 - iii. building codes
 - iv. barrier free requirements
 - v. fixture carriers

Practical Requirements:

1. Read and interpret architectural, mechanical and electrical drawings.
2. Determine, sketch and apply dimensioning.
3. Read and interpret specifications.
4. Complete a material take-offs.

PF1650 Hot Water Storage Tanks and Heaters

Learning Outcomes:

- Demonstrate knowledge of how hot water heaters function.
- Demonstrate knowledge of the procedures used to install, maintain, repair, test and troubleshoot hot water storage tanks and heaters.

Duration: 18 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 4.01 Performs piping system layout.
- 4.06 Commissions systems.
- 4.07 Protects piping systems, equipment and structure from damage.
- 12.01 Sizes piping and equipment for potable water distribution systems.
- 12.03 Installs potable water distribution equipment.
- 12.05 Tests potable water distribution systems.
- 12.06 Services potable water distribution systems.

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify and interpret drawings, specifications and manufacturer's literature.
3. Describe the procedures used to install storage tanks and heaters.
 - i. related piping
 - ii. safety valves and controls
 - iii. dip tubes in hot water storage tanks
4. Describe the procedures used to connect heat exchanger coils to storage tanks.
5. Describe safety regulations and precautions for the installation of storage tanks and heaters.

6. Identify and interpret National Plumbing Code sections which apply to the application, installation and testing of hot water storage tanks and heaters.
7. Describe common sources of heat for tanks.
 - i. oil
 - ii. gas
 - iii. electric
8. Describe domestic hot water heating equipment, their components and operation.
 - i. electrolysis
 - ii. dip tube
 - iii. magnesium rod
 - iv. insulation
 - v. sizing
 - vi. piping
 - vii. source of heat
 - viii. direct heat
 - ix. indirect heat
 - x. controls and safety devices
 - xi. pressure relief valves
 - xii. temperature relief valves
 - xiii. combined pressure/temperature relief valve
 - xiv. aquastats and thermostats
9. Describe the procedures used to perform various hot water tank installations.
 - i. direct heating
 - ii. indirect heating
 - iii. water volume expansion
 - iv. considerations
10. Describe the procedures used to plan and carry out installation of water heaters.
 - i. selecting location
 - ii. installing water pipes and shut off valve
 - iii. installing relief valves
 - iv. filling
 - v. wiring (electrician)
 - vi. vacuum relief

11. Identify tests required for hot water heaters and describe their associated procedures.
 - i. electric
 - ii. mineral
 - iii. bacteria

12. Describe the procedures used to estimate materials.

Practical Requirements:

1. Install and test a domestic hot water heater.

PF1710 Residential Appliances, Fixtures and Trim

Learning Outcomes:

- Demonstrate knowledge of how to select and install plumbing fixtures, appliances and trim for a variety of residential applications.

Duration: 30 Hours

Pre-requisite(s): PF1340; PF1350; PF1360; PF1630; PF1640; PF1650; PF1660; PF1680

2016 RSOS Reference:

4.01	Performs piping system layout
4.06	Commissions systems
14.01	Installs fixture supports
14.02	Installs plumbing fixtures and appliances
14.03	Tests plumbing fixtures and appliances
14.04	Services plumbing fixtures and appliances

Objectives and Content:

Common Bathroom Fixtures and Trim

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe common fixtures, their manufacturer and characteristics.
 - i. importance of completing the job well
 - ii. common fixtures
 - iii. receiving and handling of fixtures
 - iv. use of manufacturers' instructions

3. Describe the procedures used to install common bath and shower trim and/or accessories.
 - i. bath and shower
 - ii. water supply and drainage connections
 - iii. bath and shower trim
 - iv. shower heads
4. Describe the procedures used to install common types of lavatories.
 - i. wall hung lavatory
 - ii. water supply and drainage connections
 - iii. lavatory on concealed supports
 - iv. counter top lavatory
 - v. lavatory fittings, trim and accessories
5. Describe the procedures used to install common types of water closets, bowls, trim and accessories including water supply and drainage connections.
6. Describe the procedures used to install shower stalls including water supply and
 - i. drainage connections.
7. Describe the procedures used to install bidet and parts including water supply and drainage connections.
8. Identify and interpret the National Plumbing Code Sections which apply to the
 - i. installation and testing of common bathroom fixtures and trim.

Kitchen Sinks and Accessories

9. Identify and interpret sources of information and instructions.
 - i. drawings
 - ii. specifications
 - iii. manufacturer's literature
10. Describe the types of sinks, their trim and accessories.
11. Describe procedures used for installation of kitchen sinks.
 - i. installation
 - ii. drain connection

12. Describe the procedures used for installation of a garbage grinder or garburator.
 - i. installation
 - ii. drain connection
 - iii. electrical connections (safety)
13. Describe the procedures used for installation of dishwashers.
14. Describe the procedures used for installation of hot water dispensers.
15. Identify and interpret the National Plumbing Code Sections that apply to the
 - i. installation and testing of kitchen sinks and accessories.

Washing Machines and Laundry Trays

16. Identify and interpret sources of information for installation.
 - i. drawings
 - ii. specifications
 - iii. manufacturer's literature
17. Describe the types of laundry trays and accessories, their characteristics and applications.
18. Describe the procedures used to install washing machines.
 - i. procedures
 - ii. cross connections prevention
 - iii. water supply connections
 - iv. waste connections
 - v. check operating cycle
19. Identify and interpret the National Plumbing Code sections that apply to the
 - i. installation and testing of laundry trays and washing machines.

Plumbing Accessories

20. Describe the types of plumbing accessories, their characteristics and
 - i. applications.
 - ii. grab bars
 - iii. soap dispenser
 - iv. paper towel dispenser
 - v. toilet paper holder

- vi. towel shelves
 - vii. towel pins
 - viii. single and double hooks
 - ix. soap holders and dishes
 - x. paraplegic equipment
 - xi. shower curtain rods
 - xii. shower doors
-
- 21. Describe procedures used to install the various types of plumbing accessories.
 - 22. Identify and interpret the National Building Code sections which apply to the requirements and installation of plumbing accessories.

Practical Requirements:

- 1. Install and test residential plumbing appliances, accessories, fixtures and trim.

PF1451 Hydronic Heating

Learning Outcomes:

- Demonstrate knowledge of the operation of hot water boilers and heating systems, their component parts and control systems.

Duration: 69 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 4.06 Commissions systems.
- 4.07 Protects piping systems, equipment and structure from damage.
- 17.01 Sizes piping and components for hydronic systems.
- 17.02 Installs piping and components for hydronic systems.
- 17.03 Tests piping and components for hydronic systems.
- 17.04 Services piping and components for hydronic systems

Objectives and Content:

1. Define terminology associated with hydronic heating.

2. Identify sources of heat used in hydronic systems.
 - i. oil
 - ii. gas
 - iii. geothermal
 - iv. solar

3. Identify types of heating systems, their components and operation
 - i. one pipe
 - ii. directional flow (monoflo)
 - iii. series loop
 - iv. two pipe
 - v. direct
 - vi. reverse return

- vii. primary loop
- viii. secondary circuit
- ix. gravity systems

Boiler and Components

- 4. Describe boiler components and their purpose.
 - i. burner
 - ii. wiring
 - iii. tridicator
 - iv. aquastat
 - v. relief valve
 - vi. boiler water feed valve
 - vii. boiler fittings
 - viii. boiler drain
 - ix. tank fittings and valves
 - x. airtrol system
 - xi. air venting
 - xii. backflow prevention device

- 5. Describe expansion tanks and air control devices and procedures for their installation.
 - i. air control
 - automatic
 - manual
 - ii. tanks
 - diaphragm
 - compression

- 6. Describe the procedures used to remove air from hydronic systems.

- 7. Describe circulating pumps, their components and operation.
 - i. circulating pumps
 - ii. low head pumps

- 8. Describe equipment used for erecting boilers.
 - i. dog and clamps
 - ii. tie rods
 - iii. corrugated expansion washers
 - iv. rigging equipment

9. Describe the construction of modern package boilers.
 - i. components
 - ii. section assemblies
 - iii. top clean out openings
 - iv. integral flue gas collector and smoke collar
 - v. tank-less water heaters

10. Describe procedures used to install packaged boilers.
 - i. general erection instructions
 - ii. boiler foundations
 - iii. codes and regulations

Piping

11. Describe zone valves, their purpose and operation.
 - i. electric motor
 - ii. orifice seat sizes
 - iii. end switch
 - iv. thermostats
 - v. three-way valves

12. Describe piping arrangements used with heating systems.
 - i. piping layout and system components
 - ii. piping systems
 - iii. types and rating of heat distributing units

13. Describe the factors that affect pipe sizing and piping arrangement.
 - i. equivalent direct radiation
 - ii. piping systems
 - iii. changes in pipe size
 - iv. heat loss calculations

14. Describe zone control systems, their types, characteristics and operation.

15. Describe thermostats, their characteristics and controls.
 - i. differential
 - ii. adjustment
 - iii. sensitivity
 - iv. classification
 - v. installation procedures

16. Describe feedwater treatment systems and additives.
 - i. chemicals used in boiler feedwater
 - ii. methl hydrate
 - iii. glycol
17. Identify and interpret codes and regulations pertaining to the installation of piping systems.

Heat Transfer

18. Describe methods of heat transfer.
 - i. radiation
 - ii. conduction
 - iii. convection
19. Identify types of heat transfer equipment and describe their characteristics, piping arrangements and installation procedures.
 - i. heating units
 - ii. radiators
 - iii. baseboard heating
 - iv. wall fin
 - v. convectors
 - vi. pipe coils
 - vii. unit heaters horizontal and vertical unit heaters

Radiant Floor Heating

20. Describe the principles and operating characteristics of radiant floor heating.
21. Describe types of tubing used for radiant in-floor hydronic systems.
 - i. polymer piping materials
 - ii. PEX tubing
 - iii. rubber-based tubing
 - iv. steel
 - v. copper
22. Identify types of mixing components and describe their operation and applications.
 - i. three-port valves
 - ii. four-port valves

- iii. thermostatic valves
 - iv. motorized-actuated valves
 - v. injection pump
23. Describe slab-on-grade in-floor heating, preparation and installation procedures.
- i. tie spacing
 - ii. wire mesh
 - iii. plastic tracks
 - iv. spacing tubing
 - v. tubing depth
 - vi. insulation
 - vii. installation procedure
 - viii. floor preparation
24. Identify requirements for manifold stations and tubing installations.
- i. mark out on plan
 - ii. studded wall cavities
 - iii. use of template block
 - iv. centers on block
 - v. plastic bed supports
 - vi. label circuits
 - vii. pressure test
 - viii. control joints

Practical Requirements:

- 1. Install hydronic heating boiler and trim.
- 2. Install maintain and repair various types of hydronic heating systems.
 - i. series loop
 - ii. direct return
 - iii. reverse return
 - iv. primary loop
 - v. secondary circuit
 - vi. in-floor

PF1660 Water Treatment Systems

Learning Outcomes:

- Demonstrate knowledge of how water treatment systems function.
- Demonstrate knowledge of domestic water treatment equipment and component parts.

Duration: 6 Hours

Pre-requisite(s): PF1340

2016 RSOS Reference:

- 4.06 Commissions systems.
- 4.07 Protects piping systems, equipment and structure from damage.
- 15.01 Sizes water treatment equipment.
- 15.02 Installs water treatment equipment.
- 15.03 Tests water treatment equipment.
- 15.04 Services water treatment equipment.

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify and interpret drawings, specifications, manufacturer's literature and regulatory guidelines.
3. Describe testing procedures used to determine treatment required.
4. Describe the procedures used to size water treatment equipment.
5. Describe the procedures used to install water treatment equipment and component parts.
6. Describe potential dangers of and methods of preventing cross connection.

7. Describe water problems, their causes and effects.
 - i. hardness
 - ii. minerals
 - iii. contamination
 - iv. acid
 - v. taste and odor

8. Describe the devices used to correct water problems, their types and characteristics.
 - i. filters
 - ii. softeners
 - iii. conditioners
 - iv. purifiers

9. Describe the procedures and safety considerations used to treat water contamination.
 - i. ultraviolet

Practical Requirements:

None

PF1691 Storm Systems

Learning Outcomes:

- Demonstrate knowledge of building storm drains and storm drainage systems.
- Demonstrate knowledge of building storm drains and storm drainage systems.

Duration: 13 Hours

Pre-requisite(s): PF1680; PF1340

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe the purpose, properties and theories of storm drain systems and combined systems.
3. Explain common terminology associated with storm drainage systems.
4. Describe the components of a commercial storm drainage system:
 - i. storm building sewer and storm building drain
 - ii. combined building sewer and storm building drain
 - iii. combined sewer
 - iv. sub-soil drains
 - v. roof drains
5. Describe the procedures used to determine the hydraulic load from roofs or paved surfaces and explain rainfall intensities.
6. Identify and interpret plumbing code requirements for storm drain systems.
7. Explain the procedures of sizing the storm building drain or sewer or combined building sewer.
 - i. interpret plumbing code requirements
 - ii. determine hydraulic load
 - iii. determine grade

8. Explain the procedures of sizing rain water leaders.
 - i. interpret plumbing code requirements
 - ii. circular/non-circular
 - iii. determine hydraulic load

9. Describe the procedures for installing rain water leaders.
 - i. piping materials
 - ii. interference
 - iii. hangers and support
 - iv. protection and identification
 - v. testing and inspection

10. Explain the methods of sizing roof gutters.
 - i. interpret plumbing code requirements
 - ii. determine hydraulic load
 - iii. determine grade
 - iv. determine area of gutter

11. Describe the following roof drain terminology:
 - i. drain body
 - ii. receiver
 - iii. dome
 - iv. extension
 - v. clamping ring
 - vi. gasket
 - vii. deck clamp

12. Describe the procedures used to locate and install roof and area drains.
 - i. determine low point
 - ii. layout
 - iii. cut and sleeve openings
 - iv. installation
 - v. secure/protection
 - vi. connection to piping

13. Describe the methods of protecting rain water leaders from the following:
- i. sweating
 - ii. frost/freezing
 - iii. expansion
 - iv. thrust

Practical Requirements:

None

PF1720 Rural Waste Disposal

Learning Outcomes:

- Demonstrate knowledge of the sizing, planning and installation of rural waste disposal systems.

Duration: 15 Hours

Pre-requisite(s): PF1340

Objectives and Content:

Septic Tanks and Disposal Fields

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe the location of a septic tank.
 - i. house
 - ii. well
 - iii. property lines
3. Describe the design features of a septic tank.
 - i. size
 - ii. materials liquid capacity
 - iii. measurements
 - iv. manholes
 - v. covers
 - vi. tank extensions
 - vii. tees
 - viii. baffles
 - ix. drop through tank

4. Describe the procedures used to install a septic tank.
 - i. building drain height
 - ii. depth in ground
 - iii. set tank level
 - iv. tank test
 - v. correct in and outlet
 - vi. tank covering
5. Describe the purpose and operation of a septic tank scum.
6. Describe the purpose and operation of a syphon or a lift pump in the septic tank.
7. Describe the purpose and components of an on-site sewage system.
 - i. tank
 - ii. pipe
 - iii. gravel
 - iv. soil
8. Describe the elements of site evaluation.
 - i. lot size and dimensions
 - ii. lot topography
 - iii. water table
 - iv. bedrock
 - v. minimum distances
9. Describe the textural properties of soils and their significance to rural waste disposal.
10. Describe the operation for disposal field soils.
 - i. aerobic bacteria
 - ii. anaerobic bacteria
 - iii. maximum loading rates
 - iv. soil permeability

11. Describe the types of materials used for disposal fields and the procedures used for installation.
 - i. pipe
 - ii. fittings
 - iii. grades
 - iv. gravel
 - v. geotextile
 - vi. sand
 - vii. imported fill
12. Describe a leaching chamber disposal system, its design and applications.
13. Describe some of the dangers of unregulated sewage and liquid-borne waste.
 - i. danger to health
 - ii. transmission of communicable diseases
 - iii. danger to wells and water sources
 - iv. danger to aquatic and animal life

Inspection, Maintenance and Regulations

14. Explain the inspection points:
 - i. pre-inspection
 - ii. final inspection
15. Describe the care and maintenance of septic tanks and disposal systems.
16. Describe the purpose and content of provincial regulations respecting on-site sewage disposal systems.
 - i. definitions
 - ii. permits
 - iii. lot category
 - iv. clearances
 - v. manufacture of septic tank or other disposal system appurtenances
 - vi. licensing of installers
 - vii. licensing of septic tank cleaners
 - viii. percolation test procedure

Practical Requirements:

None

AP1101 Introduction to Apprenticeship

Learning Outcomes:

- Demonstrate knowledge of how to become a registered apprentice.
- Demonstrate knowledge of the steps to complete an apprenticeship program.
- Demonstrate knowledge of various stakeholders in the apprenticeship process.
- Demonstrate knowledge of the Red Seal Program.

Duration: 15 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define the following terms:
 - i. apprenticeship
 - ii. apprentice vs. registered apprentice
 - iii. Journeyperson vs. Certified Journeyperson
 - iv. Certificate of Apprenticeship
 - v. Certificate of Qualification
 - vi. Recognition of Prior Learning
 - vii. dual certification

2. Explain the apprenticeship system in Newfoundland and Labrador and the roles and responsibilities of those involved.
 - i. registered apprentice
 - ii. training institution
 - iii. employer
 - iv. Journeyperson
 - v. Department of Advanced Education and Skills
 - Industrial Training Section
 - Standards and Curriculum Section
 - vi. Provincial Trade Advisory Committees
 - vii. Provincial Apprenticeship and Certification Board

3. Identify the Conditions Governing Apprenticeship.
4. Describe the training and educational requirements.
 - i. pre-employment (entry level) training
 - ii. block release
 - iii. on-the-job
5. Explain the steps in the registered apprenticeship process.
 - i. criteria for eligibility
 - entrance requirements as per Conditions of Apprenticeship
 - employment
 - ii. registration process
 - application requirements
 - iii. Memorandum of Understanding
 - probation period
 - cancellation
 - iv. Record of Occupational Progress (Logbook)
 - signing off skills
 - recording hours
 - updating PDO on progress
 - v. class calls
 - schedule
 - EI Eligibility
 - Direct Entry
 - advanced level
 - vi. Block Exams
 - vii. progression
 - schedule
 - wage rates
 - viii. cancellation of apprenticeship
 - ix. Practical Examinations
 - x. Provincial and Interprovincial examinations
 - xi. certification
 - Certification of Apprenticeship
 - Certification of Qualification
 - Provincial certification
 - Interprovincial Red Seal endorsement

6. Explain the Interprovincial Standards Red Seal Program.
 - i. designated Red Seal trade
 - ii. the National Occupational Analysis (NOA)
 - iii. Interprovincial (IP) Red Seal Endorsement Examination
 - iv. relationship of NOA to IP Examination
 - v. qualification recognition and mobility
7. Identify the current financial incentives available to apprentices.
8. Explain the NL apprenticeship and trades certification division's out-of- province apprenticeship policy.

Practical Requirements:

1. Use the Provincial Apprenticeship and Trades Certification web site at www.gov.nl.ca/app to:
 - i. locate, download, and complete the Application for Apprenticeship and Memorandum of Understanding (MOU)
 - ii. locate, download, and complete the Out of Province registration forms
 - Application for Apprenticeship (out of province)
 - Letter of Understanding (LOU)
 - Acceptance of Conditions Letter
 - iii. locate, download, and complete the Work Experience Credits form
 - iv. identify the locations of all Industrial Training offices
 - v. locate and review the following learning resources relevant to the trade:
 - Study Guide
 - Exam Preparation Guide
 - Plan of Training
2. Use a logbook for this trade to:
 - i. identify the hours for the trade (in-school and on-the-job)
 - ii. identify the number of blocks
 - iii. identify the courses in each block
 - iv. identify the workplace skills to be completed and verified

3. Use the Red Seal Web site, <http://www.red-seal.ca> to retrieve the National Occupational Analyses (NOA) for this trade.
 - i. identify the following components of the NOA:
 - Trends
 - Scope
 - Key Competencies
 - Blocks
 - Tasks
 - Subtasks
 - Pie Charts
 - Table of Specifications

AM1100 Math Essentials

Note: It is recommended that AM1100 be delivered in the first semester of the Entry Level training program.

Learning Outcomes:

- Demonstrate knowledge of the numeracy skills required to begin the 2nd level math course.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of mathematical principles in trade problem solving situations.
- Demonstrate the ability to solve simple mathematical word problems.

Duration: 30 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor should use trade specific examples to reinforce the course objectives

1. Use multiplication tables from memory.
2. Perform whole number operations.
 - i. read, write, count, round off, add, subtract, multiply and divide whole numbers
3. Apply the order of operations in math problems.
4. Perform fraction and mixed number operations.
 - i. read, write, add, subtract, multiply and divide fractions

5. Perform decimal operations.
 - i. read, write, round off, add, subtract, multiply and divide decimals
6. Perform percent/decimal/fraction conversion and comparison.
 - i. convert between fractions, decimals and percents
7. Perform percentage operations.
 - i. read and write percentages
 - ii. calculate base, rates and percentages
8. Perform ratio and proportion operations.
 - i. use a ratio comparing two quantities with the same units
 - ii. use a proportion comparing two ratios
9. Use the imperial measurement system in math problems.
 - i. identify units of measurement for:
 - length
 - mass
 - area
 - volume
 - capacity
10. Use the metric measurement system in math problems.
 - i. identify units of measurement for:
 - length
 - mass
 - area
 - volume
 - capacity

Practical Requirements:

1. To emphasize or further develop specific knowledge objectives, students will be asked to complete practical demonstrations which confirm proper application of mathematical theory to job skills.

AM1260 Pipe Trade Math Fundamentals

Learning Outcomes:

- Demonstrate knowledge of mathematical concepts in the performance of trade practices.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of solving mathematical word problems.
- Demonstrate knowledge of mathematical principles for the purposes of problem solving, job and materials estimation, measurement, calculation, system conversion, diagram interpretation and scale conversions, formulae calculations, and geometric applications.

Duration: 30 Hours

Pre-Requisite(s): AM1100

Objectives and Content:

The instructor is required to use trade specific examples to reinforce the course objectives.

1. Employ percent/decimal/fraction conversion and comparison in trade specific situations.
2. Apply ratios and proportions to trade specific problems.
3. Use the Imperial Measurement system in trade specific applications.
4. Use the Metric Measurement system in trade specific applications.
5. Complete Imperial/Metric conversions in trade specific situations.
 - i. convert between imperial and metric measurements
 - ii. convert to another unit within the same measurement system

6. Manipulate formulas using cross multiplication, dividing throughout, elimination, and substitution to solve trade specific problems, such as:
 - i. right angle triangles
 - ii. area
 - iii. volume
 - iv. perimeter

7. Perform calculations involving geometry that are relevant to the trade, such as:
 - i. angle calculations
 - ii. circle calculations

8. Use practical math skills to complete administrative trade tasks.
 - i. material estimation
 - ii. material costing
 - iii. time & labour estimates
 - iv. taxes & surcharges
 - v. markup & projecting revenue

Practical Requirements:

1. To emphasize or further develop specific knowledge objectives, students will be asked to complete practical demonstrations which confirm proper application of mathematical theory to job skills.

Note:

This course has been designated as NON-TRANSFERABLE to other trades programs, and NOT ELIGIBLE FOR PRIOR LEARNING ASSESSMENT. Students completing training in this trade program are required to complete this math course.

CM2160 Communication Essentials

Learning Outcomes:

- Demonstrate knowledge of the importance of well-developed writing skills in the workplace and in career development.
- Demonstrate knowledge of the purpose of various types of workplace correspondence.
- Demonstrate knowledge of the principles of effective workplace writing.
- Demonstrate knowledge of standard formats for letters and memos.
- Demonstrate knowledge of principles related to writing effective letters and memos.
- Demonstrate the ability to prepare and deliver an oral presentation.
- Demonstrate knowledge of the importance of effective interpersonal skills in the workplace.

Duration: 45 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify the principles for writing clear, concise, complete sentences and paragraphs which adhere to the conventions of grammar, punctuation, and mechanics.
2. Identify the principles of effective workplace writing.
 - i. describe the value of well-developed writing skills to career success
 - ii. discuss the importance of tone, and language or word choice in workplace communication, regardless of the circumstances
 - iii. demonstrate an awareness of cultural differences when preparing workplace correspondence
 - iv. describe the writing process as it applies to workplace communication
 - planning

- writing
 - editing/revising
 - v. identify the parts of a business letter and memo, and when each should be used in the workplace
 - vi. identify the standard formats for business letters and memos
 - vii. identify guidelines for writing sample letters and memos which convey:
 - acknowledgment
 - routine request
 - routine response
 - complaint
 - refusal
 - persuasive request
 - letters of appeal
3. Identify types of informal workplace documents.
- i. identify types & purposes of reports
 - incident
 - process
 - progress
 - ii. identify common trade specific forms
 - iii. describe primary and secondary methods used to gather information
 - iv. discuss the importance of accuracy and completeness in reports and forms
4. Identify the elements of presentations used in the workplace.
- i. identify presentation types
 - impromptu
 - informative
 - demonstration
 - persuasive
 - ii. identify the components of an effective presentation
 - eye contact
 - body language
 - vocal qualities
 - audience analysis
 - multimedia tools
 - keeping on topic

5. Demonstrate an understanding of interpersonal communications in the workplace.
 - i. identify listening techniques
 - ii. demonstrate an understanding of group dynamics
 - iii. describe the importance of contributing information and expertise in the workplace
 - iv. describe the importance of respectful and open communication in the workplace
 - v. identify methods to accept and provide feedback in a constructive and considerate manner
 - vi. explain the role of conflict in a group to reach solutions

6. Identify acceptable workplace uses of communication technologies.
 - i. cell / Smart Phone etiquette
 - ii. voice mail
 - iii. e-mail
 - iv. teleconferencing / videoconferencing for meetings and interviews
 - v. social networking
 - vi. other emerging technologies

Practical Requirements:

1. Write well-developed, coherent, unified paragraphs.
2. Write sample letters and memos.
3. Write one short informal report.
4. Complete a selection of at least 3 trade-related forms.
5. Deliver an effective oral presentation.

SD1760 Workplace Essentials

Note: It is recommended that SD1760 be delivered in the second half of the Entry Level training program.

Learning Outcomes:

- Demonstrate knowledge of workplace essentials in the areas of meetings, unions, workers compensation, workers' rights, and human rights.
- Demonstrate knowledge of good customer service practices.
- Demonstrate knowledge of effective job search techniques.

Duration: 45 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify common practices related to workplace meetings.
 - i. identify and discuss meeting format and preparation required for a meeting
 - ii. explain the purpose of an agenda
 - iii. explain the expected roles, responsibilities, and etiquette of meeting participants

2. Define unions and identify their role in the workplace.
 - i. identify the purpose of unions
 - ii. identify a common union structure
 - iii. identify the function of unions in this trade

3. Demonstrate an understanding of the Worker's Compensation process.
 - i. describe the aims, objectives, regulations and benefits of the Workplace Health, Safety and Compensation Commission
 - ii. explain the role of the Workers Advisor
 - iii. explain the internal review process

4. Demonstrate an understanding of workers' rights.
 - i. define labour standards
 - ii. identify regulations, including:
 - hours of work & overtime
 - termination of employment
 - minimum wages & allowable deductions
 - statutory holidays, vacation time, and vacation pay

5. Demonstrate an understanding of Human Rights issues.
 - i. examine the Human Rights Code and explain the role of the Human Rights Commission
 - ii. define harassment in various forms and identify strategies for prevention
 - direct
 - systemic
 - adverse effect
 - iii. identify gender and stereotyping issues in the workplace
 - iv. define basic concepts and terms related to workplace diversity including age, race, culture, religion, socio-economic status, and sexual orientation

6. Demonstrate an understanding of quality customer service.
 - i. explain why quality service is important
 - ii. identify barriers to quality customer service
 - iii. identify customer needs & common methods for meeting them
 - iv. identify and discuss the characteristics & importance of a positive attitude
 - v. identify the importance of demonstrating good communication skills including body language, listening, questioning, and when using electronic communication devices
 - vi. identify techniques for interacting with challenging customers to address complaints and resolve conflict

7. Demonstrate an understanding of effective job search techniques.
 - i. identify and explain employment trends, opportunities, and sources of employment
 - ii. identify and discuss essential skills for the trades as outlined by Human Resources and Skills Development Canada
 - iii. review job ads and identify the importance of fitting qualifications to job requirements
 - iv. identify the characteristics of effective resumes, the types of resumes, and principles of resume formatting
 - v. identify the characteristics of an effective cover letter
 - vi. identify the components of a portfolio, and discuss the value of establishing and maintaining a personal portfolio
 - vii. identify the common characteristics of the job interview process:
 - pre-interview preparation
 - interview conduct
 - post-interview follow up

Practical Requirements:

1. Create a resume.
2. Create a cover letter.
3. Participate in a mock job interview.

MC1060 Computer Essentials

Learning Outcomes:

- Demonstrate knowledge of computer systems and their operation.
- Demonstrate knowledge of popular software packages and their applications.
- Demonstrate knowledge of security issues related to computers.

Duration: 15 Hours

Pre-Requisite(s): None

Objectives and Content:

Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.

1. Identify the major external components of a microcomputer system.
 - i. input devices
 - ii. output devices
 - iii. central control unit

2. Use operating system software.
 - i. start and quit a program
 - ii. use the help function
 - iii. use the find function
 - iv. maximize and minimize a window
 - v. use the task bar
 - vi. adjust desktop settings such as screen savers, screen resolution, and backgrounds
 - vii. shut down a computer

3. Perform file management commands.
 - i. create folders
 - copy files and folders
 - move files and folders
 - rename files and folders
 - delete files and folders

4. Use word processing software to create documents.
 - i. enter text
 - ii. indent and tab text
 - iii. change text attributes (bold, underline, font, etc.)
 - iv. change layout format (margins, alignment, line spacing)
 - v. spell check and proofread
 - vi. edit text
 - vii. save document
 - viii. print document
 - ix. close document
 - x. retrieve documents

5. Use spreadsheet software to create spreadsheets.
 - i. enter data in cells
 - ii. create formulas to add, subtract, multiply and divide
 - iii. save spreadsheet
 - iv. print spreadsheet
 - v. close spreadsheet
 - vi. retrieve spreadsheet

6. Access the Internet.
 - i. access websites using the world wide web(www)
 - ii. identify examples of web browsers
 - iii. use search engines with common searching techniques
 - iv. describe security issues

7. Use electronic mail.
 - i. describe e-mail etiquette
 - grammar and punctuation
 - privacy and legal issues when sharing and forwarding e-mail
 - work appropriate content
 - awareness of employer policies
 - ii. manage e-mail using the inbox, sent, and deleted folders
 - iii. send an e-mail message with attachment(s)
 - iv. print e-mail

Practical Requirements:

None.

C. Conditions Governing Apprenticeship Training

1.0 General

The following general conditions apply to all apprenticeship training programs approved by the Provincial Apprenticeship and Certification Board (PACB) in accordance with the *Apprenticeship Training and Certification Act (1999)*. If an occupation requires additional conditions, these will be noted in the specific Plan of Training for the occupation. In no case should there be a conflict between these conditions and the additional requirements specified in a certain Plan of Training. All references to Memorandum of Understanding will also apply to Letter of Understanding (LOU) agreements.

2.0 Entrance Requirements

2.1 Entry into the occupation as an apprentice requires:

Indenturing into the occupation by an employer who agrees to provide the appropriate training and work experiences as outlined in the Plan of Training.

2.2 Notwithstanding the above, each candidate must have successfully completed a high school program or equivalent, and in addition may be required to have completed certain academic subjects as specified in a particular Plan of Training. Mature students, at the discretion of the Director of Apprenticeship and Trades Certification, may be registered. A mature student is defined as one who has reached the age of 19 and who can demonstrate the ability and the interest to complete the requirements for certification.

2.3 At the discretion of the Director of Apprenticeship and Trades Certification, credit toward the apprenticeship program may be awarded to an apprentice for previous work experience and/or training as validated through prior learning assessment.

2.4 An Application for Apprenticeship form must be duly completed along with a Memorandum of Understanding as applicable to be indentured into an Apprenticeship. The Memorandum of Understanding must contain signatures of an authorized employer representative, the apprentice and an official representing the Provincial Apprenticeship and Certification Board to be valid.

- 2.5 A new Memorandum of Understanding must be completed for each change in an employer during the apprenticeship term.

3.0 Probationary Period

The probationary period for each Memorandum of Understanding will be six months or 900 employment credit hours. Within that period the memorandum may be terminated by either party upon giving the other party and the PACB one week notice in writing.

4.0 Termination of a Memorandum of Understanding

After the probationary period referred to in Section 3.0, the Memorandum of Understanding may be terminated by the PACB by mutual consent of the parties involved, or cancelled by the PACB for proper and sufficient cause in the opinion of the PACB, such as that stated in Section 14.

5.0 Apprenticeship Progression Schedule, Wage Rates and Advanced Training Criteria

Progression Schedule, Wage Rate and Advanced Training Criteria are stated in the specific occupational Plan of Training for each designated apprenticeship occupation.

Progression Schedule

PLUMBER- 7200 Hours			
APPRENTICESHIP LEVEL AND WAGES			
Year	Wage Rate At This Level	Requirements for progression to next level of apprenticeship	When requirements are met, the apprentice will progress to...
1 st	60 %	<ul style="list-style-type: none"> ▪ Completion of pre-employment training ▪ Registration as an apprentice ▪ Minimum 1800 hours of combined relevant work experience and training 	2 nd Year
2 nd	70%	<ul style="list-style-type: none"> ▪ Completion of AACS Level 2 training ▪ Pass Level 2 exam ▪ Minimum 3600 hours of combined relevant work experience and training 	3 rd Year
3 rd	80%	<ul style="list-style-type: none"> ▪ Completion of AACS Level 3 training ▪ Pass Level 3 exam ▪ Minimum 5400 hours of combined relevant work experience and training 	4 th Year
4 th	90%	<ul style="list-style-type: none"> ▪ Completion of AACS Level 4 training ▪ Pass Level 4 exam ▪ Minimum 7200 hours of combined relevant work experience and training ▪ Sign-off of all workplace skills in apprentice logbook ▪ Pass certification exam 	Journeyman Certification
<p>Wage Rates</p> <ul style="list-style-type: none"> ▪ Rates are percentages of the prevailing journeyman's wage rate in the place of employment of the apprentice. ▪ Rates must not be less than the wage rate established by the Labour Standards Act (1990), as now in force or as hereafter amended, or by other order, as amended from time to time replacing the first mentioned order. ▪ Rates must not be less than the wage rate established by any collective agreement which may be in force at the apprentice's workplace. ▪ Employers are free to pay wage rates above the minimums specified. <p>Level Exams</p> <ul style="list-style-type: none"> ▪ This program may not currently contain Level Exams, in which case this requirement will be waived until such time as Level Exams are available. 			

PLUMBER - 7200 Hours		
CLASS CALLS (<i>AFTER APPRENTICESHIP REGISTRATION</i>)		
Call Level	Requirements for Class Call	Hours awarded for In-School Training
Level 2	<ul style="list-style-type: none"> ▪ Minimum of 3000 hours of relevant work experience and training 	180
Level 3	<ul style="list-style-type: none"> ▪ Minimum of 5000 hours of relevant work experience and training 	210
Level 4	<ul style="list-style-type: none"> ▪ Minimum of 7000 hours of relevant work experience and training 	240
<p>Class Calls at Minimum Hours</p> <ul style="list-style-type: none"> ▪ Class calls may not always occur at the minimum hours indicated. Some variation is permitted to allow for the availability of training resources and apprentices. 		

6.0 Tools

Apprentices shall be required to obtain their own hand tools applicable for the designated occupation of registration or tools as specified by the PACB.

7.0 Periodic Examinations and Evaluation

- 7.1 Every apprentice shall submit to such occupational tests and examinations as the PACB shall direct. If after such occupational tests and examinations the apprentice is found to be making unsatisfactory progress, his/her apprenticeship level and rate of wage shall not be advanced as provided in Section 5 until his/her progress is satisfactory to the Director of Apprenticeship and Trades Certification and his/her date of completion shall be deferred accordingly. Persistent failure to pass required tests shall be a cause for revocation of his/her Memorandum of Understanding.
- 7.2 Upon receipt of reports of accelerated progress of the apprentice, the PACB may shorten the term of apprenticeship and advance the date of completion accordingly.
- 7.3 For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.
- 7.4 Course credits may be granted through the use of a PACB approved matrix which identifies course equivalencies between designated trades and between current and historical Plans of Training for the same trade.

8.0 Granting of Certificates of Apprenticeship

Upon the successful completion of apprenticeship, the PACB shall issue a Certificate of Apprenticeship.

9.0 Hours of Work

Any hours employed in the performance of duties related to the designated occupation will be credited towards the completion of the term of apprenticeship. Appropriate documentation of these hours must be provided.

10.0 Copies of the Registration for Apprenticeship

The Director of Apprenticeship and Trades Certification shall provide copies of the Registration for Apprenticeship form to all signatories to the document.

11.0 Ratio of Apprentices to Journeypersons

Under normal practice, the ratio of apprentices to journeypersons shall not exceed two apprentices to every one journeyperson employed. Other ratio arrangements would be determined and approved by the PACB.

12.0 Relationship to a Collective Bargaining Agreement

Where applicable in Section 5 of these conditions, Collective Agreements take precedence.

13.0 Amendments to a Plan of Apprenticeship Training

A Plan of Training may be amended at any time by the PACB.

14.0 Employment, Re-Employment and Training Requirements

- 14.1 The Plan of Training requires apprentices to regularly attend their place of employment.
- 14.2 The Plan of Training requires apprentices to attend training for that occupation as prescribed by the PACB.
- 14.3 Failure to comply with Sections 14.1 and/or 14.2 will result in cancellation of the Memorandum of Understanding. Apprentices may have their MOUs reinstated by the PACB but would be subject to a commitment to complete the entire program as outlined in the General Conditions of Apprenticeship. Permanent cancellation in the said occupation is the result of non-compliance.
- 14.4 Cancellation of the Memorandum of Understanding to challenge journeyperson examinations, if unsuccessful, would require an apprentice to serve a time penalty of two (2) years before reinstatement as an apprentice or qualifying to receive a class call to training as a registered Trade Qualifier. Cancellation must be mutually agreed upon by the employer and the apprentice.

- 14.5 An employer shall ensure that each apprentice is under the direct supervision of an approved journeyman supervisor who is located at the same worksite as the apprentice, and that the apprentice is able to communicate with the journeyman with respect to the task, activity or function that is being supervised.
- 14.6 Under the Plan of Training the employer is required to keep each apprentice employed as long as work is available, and if the apprentice is laid off due to lack of work, to give first opportunity to be hired before another is hired.
- 14.7 The employer will permit each apprentice to attend training programs as prescribed by the PACB.
- 14.8 Apprentices who cannot acquire all the workplace skills at their place of employment will have to be evaluated in a simulated work environment at a PACB authorized training institution and have sign-off done by instructors to meet the requirements for certification.

15.0 Appeals to Decisions Based on Conditions Governing Apprenticeship Training

Persons wishing to appeal any decisions based on the above conditions must do so in writing to the Minister of Advanced Education and Skills within 30 days of the decision.

D. Requirements for Red Seal Endorsement

1. Evidence the required work experiences outlined in this Plan of Training have been obtained. This evidence must be in a format clearly outlining the experiences and must be signed by an appropriate person or persons attesting that these experiences have been obtained to the level required.
2. Successful completion of all required courses in the program.
3. A combination of training from an approved training program and suitable work experience totaling 7200 hours.

Or

A total of 9000 hours of suitable work experience.

4. Completion of a National Red Seal examination, to be set at a place and time determined by the Apprenticeship and Trades Certification Division.

E. Roles and Responsibilities of Stakeholders in the Apprenticeship Process

The apprenticeship process involves a number of stakeholders playing significant roles in the training of apprentices. This section outlines these roles and the responsibilities resulting from them.

The Apprentice:

- completes all required technical training courses as approved by the PACB.
- finds appropriate employment.
- completes all required work experiences in combination with the required hours.
- ensures work experiences are well documented.
- approaches apprenticeship training with an attitude and commitment that fosters the qualities necessary for a successful career as a qualified journeyman.
- obtains the required hand tools as specified by the PACB for each period of training of the apprenticeship program.

The Employer:

- provides high quality work experiences in an environment conducive to learning.
- remunerates apprentices as set out in the Plan of Training or Collective Agreements.
- provides feedback to training institutions, Apprenticeship and Trades Certification Division and apprentices in an effort to establish a process of continuous quality improvement.
- where appropriate, releases apprentices for the purpose of returning to a training institution to complete the necessary technical courses.
- ensures work experiences of the apprentice are documented.
- ensures a certified journeyman is currently on staff in the same trade area as the apprentice and whose certification is recognized by the NL Department of Advanced Education, Skills and Labour.

The Training Institution:

- provides a high quality learning environment.
- provides the necessary student support services that will enhance an apprentice's ability to be successful.
- participates with other stakeholders in the continual updating of programs.

The Apprenticeship and Trades Certification Division:

- establishes and maintains program advisory committees under the direction of the PACB.
- promotes apprenticeship training as a viable career option to prospective apprentices and other appropriate persons involved, such as career guidance counsellors, teachers, parents, etc.
- establishes and maintains a protocol with training institutions, employers and other appropriate stakeholders to ensure the quality of apprenticeship training programs.
- ensures all apprentices are appropriately registered and records are maintained as required.
- schedules all necessary technical training periods for apprentices to complete requirements for certification.
- administers block, provincial and interprovincial examinations.

The Provincial Apprenticeship and Certification Board:

- sets policies to ensure the provisions of the *Apprenticeship and Certification Act (1999)* are implemented.
- ensures advisory and examination committees are established and maintained.
- accredits institutions to deliver apprenticeship training programs.
- designates occupations for apprenticeship training and/or certification.