



PLUMBER

2008

Based on the National Occupational Analysis
(pg. 6 for Program Structure)



Preface

This Apprenticeship Standard is based on the 2003 edition of the National Occupational Analysis for the Plumber trade. It was developed through the cooperative efforts of the Atlantic Apprenticeship Council, which consists of both the Atlantic Directors of Apprenticeship and Apprenticeship Board Chairs. This document describes the curriculum content for the Plumber apprenticeship training program and outlines each of the technical training units necessary for the completion of apprenticeship.

Acknowledgement

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. A sincere thank you.

This Apprenticeship Curriculum Standard was approved by the Atlantic Apprenticeship Council October 1998. Revised June 2003 and March 2006.

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Program Outcomes

Upon completion of the Apprenticeship Program, apprentices will have the knowledge and skills required to perform the following tasks:

- Task 1 Plans work activities.
- Task 2 Uses and maintains hand and portable power tools and equipment.
- Task 3 Prepares piping for installation.
- Task 4 Installs support systems.
- Task 5 Tests piping, plumbing systems and equipment.
- Task 6 Supervises excavation and backfilling of trenches.
- Task 7 Protects piping systems and other plumbing equipment from damage
- Task 8 Installs fire stopping systems.
- Task 9 Acts as mentor to apprentices.
- Task 10 Installs site services.
- Task 11 Installs private sewage systems.
- Task 12 Prepares rough-in for buried interior drainage, waste and vent systems.
- Task 13 Installs rough-in for interior drainage, waste and vent systems above grades.
- Task 14 Installs water services.
- Task 15 Installs water distribution systems.
- Task 16 Installs water treatment equipment.
- Task 17 Installs plumbing fixtures and appliances.
- Task 18 Installs hydronic heating/cooling piping systems.
- Task 19 Installs hydronic heating/cooling generating equipment.
- Task 20 Installs hydronic heating/cooling transfer units.
- Task 21 Installs hydronic heating/cooling system controls.
- Task 22 Installs natural and liquefied petroleum gas (LPG) systems.
- Task 23 Installs medical gas systems.
- Task 24 Installs cross connection control.
- Task 25 Installs petroleum systems.
- Task 26 Installs other specialty systems.
- Task 27 Selects pumps.
- Task 28 Installs pumps.
- Task 29 Maintains plumbing-related systems and components.
- Task 30 Repairs plumbing-related systems and components.

Program Structure - Nova Scotia Apprenticeship Program

The courses listed below are required technical training in the Nova Scotia Plumber Apprenticeship Program.

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Atlantic Curriculum Content To Be Covered		
			Atlantic Courses		Page No.
Group A (7 Weeks)					
	Integrated Milestone		MENT-1801	Workplace Mentoring I <i>(NS Specific)</i>	127
PLGA-0802	Safety / Tools & Equipment	None	PLGA-1001	Safety & Fire Protection <i>(NS Specific)</i>	120
			PIP-200	Tools & Equipment	10
			PIP- 220	Rigging	24
PLGA-0801	Blueprint Reading & Interpretation 1 (Basic / Residential)	None	PIP-205	Blueprint 1 (Basic Residential)	13
			PLGA-1002	Math 1 <i>(NS Specific)</i>	122
PLGA-1810	Pipe, Fittings & Piping Assembly 1A (Ferrous)	PLGA-0802 Co-requisite: PLGA-1811	PIP-230	Pipe and Tubing Fundamentals	30
			PIP-235	Steel Piping	32
			PLG-400	Cast Iron Piping	62
			PLGA-1004	Math 2 <i>(NS Specific)</i>	124
PLGA-1811	Pipe, Fittings & Piping Assembly 1B (Non-Ferrous)	PLGA-0802 Co-requisite: PLGA-1810	PIP-240	Copper Piping	36
			PIP-245	Plastic Piping	38
			PIP-250	Brass Piping	40
			PIP-255	Aluminum Piping	42
PLGA-1820	Drainage & Venting Systems 1A (Residential)	PLGA-0801, 1811 Co-requisite: PLGA-1821	PLG-480	Residential Sanitary Drainage	90
			PIP-260	Piping Valves	43
			PLG-510	Residential Appliances, Fixtures & Trim	105
PLGA-1821	Drainage & Venting Systems 1B (Residential)	PLGA-0-801, 1811 Co-requisite: PLGA-1820	PLG-485	Residential Venting	94
PLGA-1822	Water Supply 1 (Water Service / Rough-In)	PLGA-0801, 1811	PLG-460	Water Service	81
			PLG-465	Hot & Cold Water Supply	84

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Atlantic Curriculum Content To Be Covered		
			Atlantic Courses		Page No.
Group B (6 Weeks)					
PLGA-1804	Blueprint Reading & Interpretation 2 (Advanced Residential / Commercial)	PLGA-0801	PIP-210	Blueprint 2 (Advanced Residential/Light Commercial)	16
PLGA-1835	Basic Electricity	None	PIP-280	Introduction to Electricity	53
PLGA-1808	Hydronic Heating 1 (Basic)	PLGA-0801, 1811	PIP-265	Hydronic Heating 1	45
			PIP-270	Hydronic Heating 2	49
PLGA-1836	Drainage & Venting Systems 2A (Storm Systems) / Soldering & Brazing	PLGA-1821	PLG-490	Storm Systems	96
			PIP-225	Introduction to Fuel Brazing and Cutting	27
PLGA-1837	Specialty Piping Applications / Pipe, Fittings & Piping Assembly 2	PLGA-0802	PLG-405	Fire Protection Systems	64
			PLG-415	Residential Sprinkler Systems	65
			PLG-425	Compressed Air and Vacuum Systems	66
			PLG-430	Chilled Water Systems	68
			PLG-435	Solar Heating Systems	69
			PLG-450	Food Processing Systems	78
			PLG-455	Non-Metallic Piping	80
			PLG-445	Historic Piping	77
PLGA-1825	Drainage & Venting Systems 2B (Commercial Drainage)	PLGA-1821, 1836	PLG-495	Commercial Drainage Waste & Venting 1	98
			PLG-500	Commercial Drainage Waste & Venting 2	100
			PLG-515	Commercial Appliances, Fixtures & Trim	108

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Atlantic Curriculum Content To Be Covered		
			Atlantic Courses		Page No.
Group C (5 Weeks)					
PLGA-1823	Water Supply 2 (Hot Water Storage Tanks & Heaters)	PLGA-1822	PLG-470	Hot Water Storage Tanks & Heaters	86
PLGA-1834	Drainage & Venting Systems 2C (Commercial Venting)	PLGA-1821, 1825, 1836	PLG-1127	Drainage & Venting Systems 2C (Commercial Venting)	118
PLGA-1807	Blueprint Reading & Interpretation 3 (Commercial / Industrial)	PLGA-0801	PIP-215	Blueprint 3 (Heavy Commercial / Industrial)	20
PLGA-1809	Hydronic Heating 2 (Advanced)	PLGA-1808	PIP-265	Hydronic Heating 1	45
			PIP-1155	Hydronic Heating 2	49
PLGA-1843	Gas Piping 1 (Low Pressure)	PLGA-1811	PIP-285	Introduction to Gas Piping 1 (Low Pressure)	55
Group D (7 Weeks)					
	Integrated Milestone		MENT-1802	Workplace Mentoring II (NS Specific)	128
PLGA-1838	Water Supply 3 (Water Softeners & Conditioning)	PLGA-1834	PLG-475	Water Treatment Systems	88
			PLGA-1003	Water Pipe Sizing (NS Specific)	123
PLGA-1842	Cross Connection Control	PLGA-1809, 1828, 1939 & 1840	PIP-275	Cross Connection Control Devices	51
			PLGA-1005	Cross Connection Control Test Procedures (NS Specific)	125
PLGA-1839	Rural Water Supply / Rural Waste	PLGA-0801, 1811	PLG-440	Rural Water Supply	70
			PLG-525	Rural Waste Disposal	112
PLGA-1840	Specialty Plumbing Applications	PLGA-1838	PIP-295	Standpipe Systems	59
			PIP-300	Medical Gas Systems	60
			PLG-520	Industrial/Commercial Appliances, Fixtures and Trim	110
			PLG-530	Lawn Sprinkler Systems	115
			PLG-535	Swimming Pool Systems	116
PLGA-1828	Drainage & Venting Systems 3 (Commercial / Industrial)	PLGA-1825	PLG-505	Drainage & Venting Systems 3 (Commercial / Industrial)	102

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Atlantic Curriculum Content To Be Covered	
			Atlantic Courses	Page No.
PLGA-1841	Gas Piping 2 (High Pressure)	PLGA-1843	PIP-290 Introduction to Gas Piping 2 (High Pressure)	57
PLGA-1844	Program Review	Entire program	PLGA-1844 Program Review (<i>NS Specific</i>)	126
Nova Scotia Plumber Apprenticeship Program: All Courses are Required				

PIP-200 Tools and Equipment

Objectives and Content:

1. Describe general safety requirements for using tools.
 - i) guarding, shielding when using tools
 - ii) body positioning
 - iii) pinch points

2. Describe the properties of metals used in hand and power tools.
 - i) tool steels for wrenches
 - ii) tool steels for saws and blades

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

4. 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

5. 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

6. 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

7. 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

8. 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

9. 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

10. 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

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

12. 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

Outcomes:

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

- demonstrate knowledge of the care and safe use of tools and equipment.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.
Practical Projects include:

- 1.

PIP-205 Blueprint 1 (Basic Residential)

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

Outcomes:

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

- interpret piping drawings in orthographic and isometric views for residential dwellings.
- complete single line sketches from drawings and blueprints.
- convert orthographic piping drawings to isometric drawings.
- convert isometric piping drawings to orthographic drawings.
- apply compass and elevations to pipe drawings.
- produce simple orthographic sketches.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

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
 - elbows
 - wye's
 - tees
 - cleanouts
 - reducers
 - unions
 - flanges

- xiii) valves
 - ball
 - check
 - gate
 - globe
 - backwater
 - pressure reducing
 - trap primer
- xiv) hangers and supports
- xv) heating
 - piping
 - heating water supply
 - water return
 - anchors
 - guides
- xvi) heating equipment
 - boilers
 - oil tanks
 - radiation
 - exchangers
 - expansion tanks
 - thermometers
 - pressure gauges
 - auto air vents
 - flex connections/loops
- xvii) 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

Outcomes:

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

- interpret piping drawings in both orthographic and isometric views for advanced residential/commercial buildings.
- complete single line sketches from advanced residential/commercial drawings and blueprints.
- convert orthographic piping drawings to isometric drawings.
- convert isometric piping drawings to orthographic drawings.
- apply compass and elevations to advanced residential/commercial pipe drawings.
- perform orthographic sketches for advanced residential/commercial installations.
- interpret architectural drawings for advanced residential/commercial installations.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

1.

Objectives and Content:

1. Identify the types of plans and describe their purpose and use for commercial/industrial projects.
 - i) plot (site)
 - ii) foundation
 - iii) floor plans
 - iv) elevations
 - v) sections
 - vi) details
 - vii) reflected ceiling drawings
 - viii) room finish schedules
 - ix) revisions
2. Describe the features contained in commercial/industrial drawings, their importance and use.
 - i) grid lines
 - ii) exploded views
 - iii) sections
 - iv) details
 - v) finish schedules
 - vi) page references
 - vii) elevations
 - viii) architectural symbols
3. Describe the sequencing and procedures used to plan materials for hangers, sleeves, and fixture carriers.
 - i) floor/slab construction
 - ii) wall construction
 - iii) structural supports
4. Identify and explain industrial mechanical, architectural and electrical symbols and abbreviations.
5. Identify and explain specifications.
 - i) breakdown of divisions
 - ii) trade responsibilities
6. Identify the use of computer aided drafting in the piping trades.

7. Identify and interpret the various piping related symbols found in a set of commercial or institutional drawings.
 - i) fixtures/piping/valve
 - ii) equipment

8. Identify and interpret the various heating related symbols found in a set of commercial or institutional drawings.
 - i) heating and cooling systems
 - ii) heating equipment
 - iii) heating valves
 - iv) fuel oil systems
 - v) fuel gas systems

9. Identify piping related systems from drawings.
 - i) kitchen equipment
 - ii) medical gas
 - iii) compressed air

10. Identify systems and their components found on institutional/commercial drawings.
 - i) mechanical
 - ii) electrical
 - iii) fire protection
 - iv) control systems

11. Describe the purpose and applications of the following information systems.
 - i) as-built/engineered drawings
 - ii) shop drawings

12. Explain the significance of providing system identification.
 - i) colour coding
 - ii) pipe identification
 - iii) valve tags, tabs, charts
 - iv) equipment identification

13. Explain the procedures used to compile material lists from drawings.

BUILDER'S LEVEL/TRANSIT/LASER LEVEL

14. Identify the parts of a builder's level/transit/laser level and describe their purpose.
 - i) telescope
 - ii) level bubbles
 - iii) leveling screws
 - iv) eye piece
 - v) focusing
 - vi) locking screws

- vii) protective lens
15. Identify the extension rod and describe its purpose and procedures for use.
 - i) height of rod
 - ii) holding the rod
 - iii) markings on rod
 - iv) readings on rod
 16. Explain leveling terms.
 - i) line of sight
 - ii) instrument location
 - iii) station
 - iv) bench mark
 - v) height of instrument
 - vi) back sight
 - vii) fore sight
 - viii) turning point
 17. Describe the procedures used to determine measurements and elevations using a builder's level.
 18. Describe the procedures used to lay out pipe lines and grades with a builder's level.
 - i) turn angle
 - ii) name station
 - iii) locate and number stations

Outcomes:

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

- interpret industrial piping drawings in both orthographic and isometric and sketch views.
- interpret architectural drawings and specifications for commercial/industrial installations.
- complete single line sketches from commercial/industrial drawings and blueprints.
- convert orthographic commercial/industrial pipe drawings to isometrics pipe drawings.
- apply compass and elevations to commercial/industrial pipe drawings.
- compile as-built, design built and shop drawings.
- demonstrate understanding of system identification procedures.
- determine measurements and elevations using a builders level.
- compile materials lists from sketches.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PIP-220 Rigging

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. Describe procedures prior to and during the movement of objects with rigging equipment.

14. Identify jacks and describe their applications and procedures for use.

15. Identify methods of communications.
 - i) hand signals
 - ii) two-way radios

16. Identify types of cranes used in rigging.
 - i) mobile
 - ii) boom truck
 - iii) overhead

Outcomes:

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

- identify the limitations of equipment used for rigging.
- demonstrate knowledge of safe operating procedures for slings, cables and cranes.
- select rigging and lifting equipment using rigging charts and manuals as well as rule of thumb methods.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PIP-225 Introduction to Fuel Brazing and Cutting

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
 - individual cylinder
 - 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
 - individual cylinder
 - 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.

BRAZING

9. Describe the principles of the brazing process and the differences between welding and brazing.
10. Describe fluxes, their applications and procedures for use.
 - i) soldering, brazing fluxes
 - ii) components and classifications of brazing fluxes
11. Describe the brazing process as applied to various metals.
12. Describe the flame adjustment for brazing various materials.
13. 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

14. List metals that can be cut using oxy-fuel equipment.

15. Describe the various styles and designs of standard cutting torches.
16. Describe the various cutting tips, their care and maintenance.
 - i) sizes, styles and indexing
 - ii) accessories and tip cleaners
17. Describe the various types of cutting flames and procedures used for flame adjustment.
 - i) oxidizing
 - ii) carburizing
 - iii) neutral
18. Describe cutting procedures.
 - i) free hand
 - ii) straight edge
19. Describe common cutting faults, their causes and remedies.

Outcomes:

Upon successful completion of this unit, the apprentice will be able to
- use fuel cutting and brazing equipment.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.
Practical Projects include:

- 1.

Objectives and Content:

1. 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

2. Identify pipe and tubing sizes.
 - i) dimensions
 - ii) lengths
 - iii) wall thickness/schedule

3. Describe the terms ferrous and non-ferrous and their significance to the trade.

4. 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

5. Describe the types of sealants used in the trade and their applications.
 - i) thread compounds
 - ii) gaskets
 - iii) packing
 - iv) cements/glue

Outcomes:

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

- 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.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PIP-235 Steel Piping

Objectives and Content:

1. List the properties and applications of steel pipe and fittings.
2. Identify ferrous 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
3. List the types of ferrous piping, their characteristics and applications.
 - i) steel
 - ii) galvanized
 - iii) stainless
 - iv) cast iron
4. 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)
5. 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
6. 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

7. 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
 - oxy/acetylene
 - electric
 - mig/tig
 - v) press-fit crimper
 - vi) vice, wrenches
 - vii) beveller

8. 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

9. 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

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

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

12. 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
13. Calculate the perimeter and areas of:
- i) squares
 - ii) rectangles
 - iii) triangles
 - iv) circles
14. Calculate the volume of:
- i) cubes
 - ii) rectangular prisms and cylinders
15. 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
16. Calculate piping measurements.
- i) run and branch
 - ii) fitting allowance
 - center
 - face
 - back
 - throat
17. Calculate piping measurements with various degree fittings.
- i) diagonal
 - ii) offset
 - iii) travel
 - iv) rise and run
 - v) factors
18. Perform piping calculations using:
- i) grade
 - ii) drop
 - iii) rise and run

Outcomes:

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

- select materials.
- demonstrate knowledge of steel pipe and fittings and their assembly.
- carry out work in compliance with codes, standards and manufacturer's literature.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PIP-240 Copper Piping

Objectives and Content:

1. 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

2. 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)

3. 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

4. Describe the tools and procedures used to join copper pipe.
 - i) solder/braze
 - ii) compression
 - iii) grooved
 - iv) swaged
 - v) flared

- vi) T-drill
 - vii) press fit
 - viii) crimped
5. Describe the tools and procedures used for soldering, bending and annealing copper pipe and fittings.
 6. Identify fittings used for joining copper pipe and describe their characteristics and applications.
 - i) terminology
 - ii) types
 - iii) parts
 - iv) acronyms and abbreviations
 7. 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
 8. Describe the procedures used to calculate fitting allowances.
 - i) tees
 - ii) elbows
 - iii) 45 degrees

Outcomes:

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

- select materials.
- demonstrate knowledge of non-ferrous pipe/tubing and its assembly.
- carry out work in compliance with codes, standards and manufacturer's literature.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PIP-245 Plastic Piping

Objectives and Content:

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

2. 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)
 - with/without oxygen barrier
 - vii) PTFE (Teflon)
 - viii) PEX/Aluminum/PEX

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

4. 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

5. Identify 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

6. 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

7. 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

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

Outcomes:

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

- select materials.
- demonstrate knowledge of plastic pipe and fittings and their assembly.
- carry out work in compliance with codes, standards and manufacturer's literature.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PIP-250 Brass Piping

Objectives and Content:

1. Identify brass pipe and fittings and describe their properties and applications.
2. Identify types and sizes of brass pipe and describe its characteristics and applications.
3. Describe methods used to cut and prepare brass pipe and their associated procedures.
 - i) pipe cutters
 - ii) reamers
 - iii) cut-off saw
 - iv) hacksaw
4. Describe the methods used to thread brass pipe and describe their associated procedures.
5. Identify the types of fittings used for joining brass pipe and describe their characteristics and applications.
 - i) terminology
 - ii) types
 - iii) parts
 - iv) acronyms and abbreviations
6. Identify and describe the tools and procedures used to hang, support and fasten brass pipe and fittings.
 - i) codes
 - ii) specifications
 - iii) grade
 - iv) components
 - v) fire stopping systems
7. Describe the procedures used to calculate fitting allowances.
 - i) tees
 - ii) elbows
 - iii) 45 degrees

Outcomes:

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

- select materials.
- demonstrate knowledge of brass pipe and fittings and its assembly.
- carry out work in compliance with codes, standards and manufacturer's literature.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PIP-255 Aluminum Piping

Objectives and Content:

1. Describe the properties and applications of aluminum pipe and tubing.

Outcomes:

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

- demonstrate knowledge of aluminum pipe and tubing.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PIP-260 Piping Valves

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
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

Outcomes:

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

- demonstrate knowledge of piping valves and their installation.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PIP-265 Hydronic Heating 1

Objectives and Content:

1. Define terminology associated with hydronic heating.
2. 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

3. 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
4. Describe expansion tanks and air control devices and procedures for their installation.
 - i) air control
 - automatic
 - manual
 - ii) tanks
 - diaphragm
 - compression
5. Describe the procedures used to remove air from hydronic systems.

6. Describe circulating pumps, their components and operation.
 - i) circulating pumps
 - ii) low head pumps
7. Describe equipment used for erecting boilers.
 - i) dog and clamps
 - ii) tie rods
 - iii) corrugated expansion washers
 - iv) rigging equipment
8. 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
9. Describe procedures used to install packaged boilers.
 - i) general erection instructions
 - ii) boiler foundations
 - iii) codes and regulations

PIPING

10. Describe zone valves, their purpose and operation.
 - i) electric motor
 - ii) orifice seat sizes
 - iii) end switch
 - iv) thermostats
 - v) three-way valves
11. Describe piping arrangements used with heating systems.
 - i) piping layout and system components
 - ii) piping systems
 - iii) types and rating of heat distributing units
12. 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
13. Describe zone control systems, their types, characteristics and operation.

14. Describe thermostats, their characteristics and controls.
 - i) differential
 - ii) adjustment
 - iii) sensitivity
 - iv) classification
 - v) installation procedures
15. Describe feedwater treatment systems.
 - i) chemicals used in boiler feedwater
16. Identify and interpret codes and regulations pertaining to the installation of piping systems.

HEAT TRANSFER

17. Describe methods of heat transfer.
 - i) radiation
 - ii) conduction
 - iii) convection
18. 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

19. Describe the principles and operating characteristics of radiant floor heating.
20. 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
21. 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
22. 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
23. 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

Outcomes:

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

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

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

Objectives and Content:

1. Identify and interpret hydronic heating schematic symbols.
2. Define the following terms:
 - i) cross connection
 - ii) back flow prevention
3. Identify types of devices used for protection of cross connection control and describe their applications.
4. Describe the operation and applications of thermostats.
 - i) line voltage
 - ii) low voltage
 - iii) automatic set back
 - iv) multiple fuel supply applications
5. Describe the operation and specify the use of hot water control systems.
6. Describe the operation and specify the use of primary controls.
7. Explain the operation of outdoor temperature sensors.
8. Describe the operation and applications of heat exchanger vacuum valves.
9. Describe the operation and applications of flow-control-control valves.
10. Describe the operation and applications of motorized valves.
11. Identify types of safety controls and describe their operation and applications.
 - i) low water cutoff and fusible plugs
 - ii) feeder cutoff combinations
 - iii) high and low water alarms
 - iv) pressure controls
 - v) gauge glass
 - vi) boiler trim
 - vii) drain and blow-down valves, pigtails and steam gauges

HEAT TRANSFER SYSTEMS

12. Describe the purpose, parts and operating principles of heat pumps.
13. Describe the procedures used to install heat pumps.
14. Describe the components and operation of the various types of solar heating systems.

Outcomes:

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

- demonstrate knowledge of the operation of commercial heating systems, their associated piping and control systems.
- demonstrate knowledge of the operation and controls of multi-zone hydronic heating systems.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify and interpret sources of information pertaining to installation.
 - i) the National Plumbing Code
 - ii) manufacturers' literature
3. Describe the division of responsibilities for cross connection control.
 - i) installation
 - ii) troubleshooting
 - iii) repair
4. Describe the cross connection control program.
 - i) administration
 - ii) legal aspects
 - iii) health aspects
 - iv) minimum standards
 - v) inspection of devices
 - vi) licensing of testers
 - vii) testing of devices
5. Identify methods and devices used for cross connection control and describe their location and operation in various systems.
6. Describe the procedures used for maintenance and repair of devices.
 - i) troubleshooting
 - ii) repair procedures
7. Describe the causes of backflow and their role in cross connection.
8. Explain backflow control.
 - i) causes
 - ii) classification of hazards
 - iii) assessment of hazards
 - iv) types of devices
 - v) selection of proper devices
 - vi) methods of backflow control
 - vii) typical occurrences and recommended protection

9. Describe the purpose and operation of:
 - i) back siphonage devices
 - ii) back pressure devices

10. Identify testable devices.
 - i) non-testable devices
 - ii) testable devices
 - iii) testing procedures

11. Describe the procedures used to install devices.
 - i) location of devices
 - ii) National Plumbing Code applications
 - iii) manufacturer's recommendations
 - iv) warranty of devices

Outcomes:

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

- identify cross connections and determine how to correct them.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit. Practical Projects include:

- 1.

PIP-280 Introduction to Electricity

Objectives and Content:

1. Explain Ohm's Law and associated formulae.
2. Explain electrical terminology.
 - i) voltage
 - ii) current
 - iii) ampere
 - iv) resistance
 - v) ohm
3. Describe what is meant by resistance and the factors affecting it.
4. Describe the characteristics of conductors and insulators and their applications.
5. Describe direct current.
6. Describe the trade related applications of direct current.
7. Describe alternating current.
8. Define terms related to alternating current.
 - i) cycle
 - ii) hertz
 - iii) electrical characteristics
9. Describe electrical circuits, their components and operation.
10. Describe the characteristics of electric circuits.
 - i) series
 - ii) parallel
 - iii) series-parallel
11. Describe the causes of excessive current.
12. Describe overload protection circuits.
13. Interpret abbreviations, formula symbols and circuit symbols found in circuit diagrams.
14. Identify and interpret nameplate data from electric circuits.

15. Describe the procedures used to troubleshoot electric motors.
16. Explain electrolysis.
17. Describe the detrimental effect of electrolysis on piping.
 - i) dissimilar piping
 - ii) incompatible pipe hanger
 - iii) underground installations of liquid and gas lines
18. Read and interpret basic electrical schematics.

Outcomes:

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

- demonstrate knowledge of electrical principles.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.
Practical Projects include:

- 1.

Objectives and Content:

1. Identify and interpret regulations governing:
 - i) natural gas and propane systems.
 - ii) transportation and storage of gas cylinders.

2. Describe the properties and characteristics of natural gas.
 - i) odor, color and taste
 - ii) state
 - iii) composition
 - iv) toxicity
 - v) specific gravity
 - vi) flame type
 - vii) excess air
 - viii) air composition
 - ix) heating value
 - x) flame temperature and speed
 - xi) limits of flammability
 - xii) ignition temperature
 - xiii) combustion process

3. Define terminology relating to gas piping.
 - i) gas main
 - ii) gas service
 - iii) shut-off valves
 - iv) branch line
 - v) riser
 - vi) drop line
 - vii) dirt pocket
 - viii) piping extension
 - ix) concealed piping
 - x) flexible connector

4. Describe safe gas piping practices and procedures.
 - i) gas code
 - ii) materials
 - iii) pipe coating
 - iv) reaming
 - v) threading
 - vi) bushings
 - vii) brazing
 - viii) joint compounds

- ix) gasket material
 - x) grades
 - xi) supports
 - xii) prohibited practices
 - xiii) limitations at certain locations
 - xiv) outlets
 - xv) concealed piping
 - xvi) pipe identification
5. Describe the procedures used to test a gas line.
- i) before appliance is connected
 - ii) purging a gas line
6. Describe the factors that determine the correct pipe sizing for gas systems 2 PSI or lower installations.
- i) length of pipe
 - ii) allowable pressure loss
 - iii) system capacity
 - iv) specific gravity of gas

Outcomes:

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

- demonstrate knowledge of the combustion process.
- demonstrate knowledge of gas piping installation according to code.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

Objectives and Content:

1. Describe the purpose, parts and operation of a gas distribution system from the well head to the service regulator.
 - i) gas well
 - ii) compressor station
 - iii) city gate station
 - iv) district regulating station
 - v) regulators
 - vi) high pressure distribution service
 - vii) high pressure distribution lines
 - viii) line pressures
 - ix) meters

2. Identify types of gas pressure regulators and describe their purpose.
 - i) low capacity
 - ii) high capacity
 - iii) combination
 - iv) loading element
 - v) measuring element
 - vi) restricting element
 - vii) 1st stage
 - viii) 2nd stage
 - ix) service
 - x) system
 - xi) appliance
 - xii) code

3. Describe the factors that determine the correct pipe sizing for gas systems over 2 PSI.
 - i) installations.
 - ii) length of pipe
 - iii) allowable pressure loss
 - iv) system capacity
 - v) specific gravity of gas
 - vi) number and type of fittings

4. Describe the purpose and operation of gas venting.
 - i) gravity or natural venting
 - ii) spillage
 - iii) combustion process
 - iv) carbon monoxide

- v) power venting
- vi) fan assisted

Outcomes:

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

- demonstrate knowledge of the combustion process.
- demonstrate knowledge of gas piping installation according to code.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PIP-295 Standpipe Systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify and interpret sources of information pertaining to installation of standpipe systems.
 - i) drawings
 - ii) specifications
 - iii) manufacturer's literature
3. Identify and interpret applicable codes for fabrication and installation of standpipe systems.

Outcomes:

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

- demonstrate knowledge of standpipe systems and their installation.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.
Practical Projects include:

1

PIP-300 Medical Gas Systems

Objectives and Content:

1. Identify and interpret sources of information pertaining to installation of medical gas systems.
 - i) drawings
 - ii) specifications
 - iii) manufacturers literature
 - iv) codes
2. Describe medical gas systems, their components, materials and operation.
3. Describe materials and procedures required to join piping for medical gas systems.
 - i) degreasing
 - ii) purging
4. Describe oxygen supply systems, their components and installation.
 - i) piping and fittings
 - ii) jointing methods
 - iii) wall outlets
 - iv) valves
 - v) testing
5. Describe vacuum systems, their components and installation.
 - i) vacuum pumps and receivers
 - ii) piping and fittings
 - iii) wall outlets
 - iv) valves
 - v) testing
6. Describe anesthetic gas systems, their components and installation.
 - i) piping and fittings
 - ii) wall outlets
 - iii) valves
 - iv) testing
7. Describe nitrogen gas systems, their components and installation.
 - i) piping and fittings
 - ii) wall outlets
 - iii) valves
 - iv) safety devices
 - v) testing

8. Describe vacuum tube and medical air systems.
 - i) compressors
 - ii) piping and fittings
 - iii) reducing stations
 - iv) valves and strainers
 - v) pressure gauges and controls
 - vi) safety devices
 - vii) testing
 - viii) air dryers
9. Describe the color coding of medical gas systems.
10. Describe provincial regulations that may apply to the installation of medical gas systems.

Outcomes:

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

- demonstrate knowledge of medical gas systems.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

1

PLG-400 Cast Iron Piping

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe the properties and applications of cast iron pipe and fittings.
 - i) drainage
 - ii) waste
 - iii) vent
 - iv) potable water
3. Identify the systems and criteria used in referencing, selecting and ordering cast iron and duriron soil pipe.
 - i) diameter
 - ii) length
 - iii) end finishes
4. 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
5. 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
6. Describe the tools and procedures used to cut ductile and duriron pipe.
 - i) cut off saw
 - ii) chop saw
 - iii) hydraulic pipe cutters
7. Describe the tools used to join cast iron soil pipe, ductile and duriron pipe.
 - i) bi-seal puller
 - ii) torque and hand wrenches

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

9. 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

10. 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

Outcomes:

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

- select materials.
- demonstrate knowledge of cast iron pipe and fittings and their assembly.
- carry out work in compliance with codes and standards.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-405 Fire Protection Systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe types of fire protection systems, their component parts and operation.
 - i) standpipe
 - ii) wet and dry
3. Describe methods of supplying water to system.
 - i) siamese connection
 - ii) tanks
 - iii) pumps

Outcomes:

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

- demonstrate knowledge of fire protection systems and their installation.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

1

PLG-415 Residential Sprinkler Systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe the purpose, components and operation of residential sprinkler systems.
3. Identify sources of information pertaining to residential sprinkler system installation, maintenance and testing and describe their use.
 - i) drawings
 - ii) specifications
 - iii) manufacturers' literature

Outcomes:

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

- demonstrate knowledge of residential sprinkler systems and their installation.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit. Practical Projects include:

1

Objectives and Content:

1. Explain air theory.
 - i) effects of water within a system
 - ii) humidity
 - iii) air treatment and storage
 - iv) safety
2. Identify component parts of vacuum systems and describe their purpose.
3. Identify and interpret sources of information applicable to the installation of compressed air systems.
 - i) drawings
 - ii) specifications
 - iii) manufacturers' literature
 - iv) codes and regulations
4. Describe types of compressors, their operating principles and applications.
 - i) rotary
 - ii) piston
5. Describe the procedures used to install compressors.
 - i) cold climate
 - ii) damp climate or high humidity
 - iii) bases and foundations
6. Describe the procedures used to install compressor piping.
 - i) inlet piping
 - ii) discharge piping
 - iii) safety valves
 - iv) shut-off valves
 - v) controls
 - vi) condensate drain valve/trap
7. Describe the procedures used to install distribution piping to draw-off point.
 - i) systems
 - laboratories,
 - instrumentation
 - workshops
 - ii) supports
 - iii) materials
 - iv) branch connections off main

- v) drop lines
- vi) drains
- vii) shut-off valves
- viii) quick-connects

8. Identify component parts of pneumatic transfer systems and describe their purpose.

Outcomes:

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

- demonstrate knowledge of compressed air and vacuum systems and their installation.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

1

PLG-430 Chilled Water Systems

Objectives and Content:

1. Describe the purpose, component parts and operation of a chilled water system.
2. Identify and interpret sources of information pertaining to the installation of chilled water systems.
 - i) drawings
 - ii) specifications
 - iii) manufacturers' literature
3. Describe the procedures used to install a chilled water system.

Outcomes:

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

- demonstrate knowledge of chilled water systems and their installation.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.
Practical Projects include:

1

PLG-435 Solar Heating Systems

Objectives and Content:

1. Identify the types of solar heating systems and describe their operating principles and applications.
 - i) passive
 - ii) forced
 - iii) direct
 - iv) indirect

2. Identify and interpret sources of information pertaining to installation.
 - i) drawings
 - ii) specifications
 - iii) manufacturers' literature

3. Describe solar heating systems, their component parts and installation procedures.
 - i) piping
 - ii) solar panels
 - iii) insulation
 - iv) controls and sensors
 - v) storage
 - vi) pumps
 - vii) electrolysis
 - viii) purging

Outcomes:

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

- demonstrate knowledge of solar heating systems and their installation.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit. Practical Projects include:

1

PLG-440 Rural Water Supply

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe the surface sources of water supply.
 - i) rivers
 - ii) lakes
 - iii) ponds
 - iv) streams
 - v) cisterns
3. List and describe the most common contamination sources of water supply.
4. Describe the types of wells, their characteristics, advantages and disadvantages.
 - i) shallow
 - ii) deep
 - iii) dug
 - iv) bored
 - v) driven
 - vi) drilled
5. Explain well terminology.
 - i) static water level
 - ii) draw down
 - iii) recovery rate
 - iv) well casing
 - v) submergence
 - vi) well cap
 - vii) pumping water level
 - viii) water seams
 - ix) well capacity
6. Describe the various purposes of a well driller's report and the information contained in it.
 - i) well owner
 - ii) well contractor
 - iii) well log
 - iv) well information
 - v) method of drilling
 - vi) water usage
 - vii) pumping rate

7. Identify provisions of Well Drilling Regulations in respect to:
- i) definitions
 - ii) location of well
 - iii) protection of aquifers
 - iv) pump installation

POSITIVE DISPLACEMENT PUMPS & ACCESSORIES

8. List and describe the components of a hydro-pneumatic system.
- i) foot valve
 - ii) piping
 - iii) clamps
 - iv) pumps
 - v) pressure tanks
 - vi) controls
 - vii) shut-off valves
 - viii) drainage
 - ix) relief valve
 - x) air volume control
9. Identify types of positive displacement pumps and describe their operating principles.
- i) gear
 - ii) helical rotary
 - iii) piston
10. Identify types of shallow well piston pumps and describe their theory of operation.
- i) types
 - single acting
 - double acting
 - dual double acting
 - ii) lift
 - iii) gallons per minute
 - iv) relief valve
 - v) priming
 - vi) pump chart
 - vii) pressure switch
11. Describe procedures used to install a shallow well piston pump.
- i) location
 - ii) pump tapping size
 - iii) suction line
 - iv) grade
 - v) depth
 - vi) foot or check valve

- vii) venting well
- viii) noise control

JET PUMPS

12. Identify types of shallow well jet pumps and describe their characteristics, parts and operation.
 - i) lift
 - ii) types
 - single stage
 - multi-stage
 - iii) parts
 - impeller
 - diffuser
 - ejector
 - pressure switch
 - motor size

13. Identify types of deep well jet pumps and describe their characteristics, parts and operation.
 - i) lift
 - ii) types
 - single stage
 - multi-stage
 - iii) parts
 - suction line
 - drive line
 - deep well ejector
 - tail pipe
 - pitless adapter
 - air vent
 - control valve or regulating valve
 - pressure switch
 - foot valve

14. Describe the installation and start up procedures for shallow and deep well jet pumps.
 - i) depth
 - ii) frost protection
 - iii) priming
 - iv) control valve

15. Describe how to read a shallow and deep well jet pump chart.
 - i) types of ejectors
 - ii) motor HP

- iii) ejector location
- iv) pipe size
- v) litres per second
- vi) gallons per minute

SUBMERSIBLE PUMPS

16. Describe the components and operation of a submersible pump.
- i) pump size
 - ii) check valve
 - iii) discharge head
 - iv) impellers
 - v) diffusers
 - vi) suction screen
 - vii) cable lead - splicing
 - viii) motor size
 - ix) voltage
 - x) torque arrestor
 - xi) wire guard
 - xii) relief valve
 - xiii) tank tee
 - xiv) pitless adaptor
17. Describe the procedure used to wire a two- or three-wire submersible pump.
- i) wire size
 - ii) distance
 - iii) voltage
 - iv) phase
 - v) control box
 - vi) start capacitor
 - vii) relay
 - viii) pressure switch
18. Describe the installation procedure for a submersible pump.
- i) inspect pump
 - ii) electrical preparation
 - iii) torque arrester
 - iv) taping wires
 - v) aligning pump
 - vi) checking flow
19. Describe how to read a submersible pump chart.
- i) pumping depth
 - ii) pressure
 - iii) litres per second

- iv) gallons per minute
- v) head loss

PRESSURE TANKS AND CONTROLS

20. Identify types of tanks and explain the reasons for a pressure tank in a pump system.
- i) types
 - water compatibility – galvanized
 - glass lined
 - fiberglass
 - bladder tank
 - diaphragm
 - ii) purpose
 - prevent rapid cycling
 - shut down period
 - storage
21. Explain pressure tank terminology.
- i) capacity
 - ii) cycle rate
 - iii) demand
 - iv) draw-down
 - v) usable water
 - vi) minimum operating pressure
 - vii) peak demand period
 - viii) supercharge
 - ix) recharge
 - x) water logging
 - xi) pressure
 - xii) pump start pressure
 - xiii) supplemental supply
22. Describe the operating principles of pressure tanks.
- i) standard galvanized tank with an air volume control
 - ii) standard galvanized tank with a floating diaphragm
 - iii) diaphragm tank
 - iv) bladder tank
 - v) floated tank
 - vi) in-line tank
 - vii) vertical and horizontal tanks
23. Describe the procedures used to size a pressure tank.
- i) tank dimensions
 - ii) peak demand

- iii) tank selection tables
 - iv) manufacturers' specifications
 - v) pump run time
24. Describe the operation of an add air type and an air release type air volume control.
- i) snifter valve
 - ii) diaphragm type
 - iii) float operated type
 - iv) vacuum booster
25. Describe the operation of a pressure switch, float switch and liquid level controllers.
- i) switch settings
 - ii) differential nut
 - iii) range nut
 - iv) low water cut off switch
 - v) depth of floats
 - vi) electrical hook up
26. Describe the procedures used to measure flow from a pump.

PUMP SERVICE AND MAINTENANCE

27. Describe the use of gauges to diagnose pump problems.
- i) pressure gauge
 - ii) compound gauge
 - iii) vacuum gauge
 - in feet
 - in inches
28. Describe the use of pump charts to diagnose causes and correct problems in a jet pump.
- i) failure to start or run
 - ii) overheating or tripping out
 - iii) frequent starting or stopping
 - iv) failure to shut off
 - v) little or no water delivery
29. Describe the use of pump charts to diagnose causes and correct problems in a submersible pump.
- i) failure to start or run
 - ii) overheating or tripping out
 - iii) frequent starting or stopping
 - iv) failure to shut off

- v) little or no water delivery
30. Describe the use of pump charts to diagnose and correct problems in a reciprocating pump.
- i) failure to start or run
 - ii) little or no water delivery
 - iii) low capacity
 - iv) pump loses its prime
 - v) frequent starting or stopping
 - vi) failure to shut off
 - vii) excessive operating noise
31. Describe the procedure for taking meter readings.
- i) ammeter
 - ii) ohmmeter
 - iii) volt meter

Outcomes:

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

- demonstrate understanding of the operation of rural water supply systems.
- demonstrate understanding of the operation, installation and repair of water pumps.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-445 Historic Piping

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify less common plumbing related piping and describe their properties and applications.
 - i) lead
 - ii) bituminized fiber
 - iii) plastic lined metal
 - iv) vitrified clay
 - v) aluminum DWV
 - vi) asbestos cement
 - vii) polybutylene
3. Describe the characteristics of lead pipe and procedures for its use.

Outcomes:

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

- demonstrate knowledge of historic piping materials.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-450 Food Processing Systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify and interpret sources of information pertaining to installation of food processing systems.
 - i) drawings
 - ii) specifications
 - iii) manufacturers' literature
 - iv) regulations and codes
3. Identify types of food processing systems and describe their purpose, components and operation.
4. Describe indirect waste connections, their purpose and installation.
5. Describe venting requirements and arrangements for food processing systems.
6. Describe traps and trap primers, their purpose, operation and location.
7. Describe cleanouts, their purpose and location.
8. Identify types of food processing equipment and accessories and describe their purpose and operating principles
 - i) ice makers
 - ii) potato peelers
 - iii) drink dispensers
 - iv) food coolers
 - v) food processing tables
 - vi) steam table
9. Describe procedures used to install food processing systems.
10. Describe procedures used to install food processing equipment.

Outcomes:

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

- demonstrate knowledge of food processing systems and their installation.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-455 Non-Metallic Piping

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.

Outcomes:

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

- select non-metallic piping materials.
- demonstrate knowledge of non-metallic piping and fittings and their assembly.
- carry out work in compliance with codes and standards.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-460 Water Service

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 sequence
 - 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
 - freezing
 - settling
 - blowouts
 - ii) blocking and rodding
 - iii) changes of direction
 - iv) backfilling
17. Describe the procedures used to install anchors, tie rods, thrust blocks and supports for water service.

Outcomes:

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

- demonstrate understanding of how water supply equipment functions.
- install piping systems for potable and non-potable water supplies.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

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.

Outcomes:

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

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

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

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.

Outcomes:

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

- demonstrate knowledge of how hot water heaters function.
- install domestic hot water heaters and storage tanks.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-475 Water Treatment Systems

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

Outcomes:

- Upon successful completion of this unit, the apprentice will be able to
- demonstrate knowledge of how water treatment systems function.
 - install domestic water treatment equipment and component parts.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-480 Residential Sanitary Drainage

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)
 - iii) determine grade
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 sequencing of 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.

Outcomes:

- Upon successful completion of this unit, the apprentice will be able to
- size building sewers and sanitary drainage systems.
 - install basic domestic drainage systems.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit. Practical Projects include:

- 1.

PLG-485 Residential Venting

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

Outcomes:

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

- plan residential venting systems.
- install basic venting systems in compliance with codes and regulations.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-490 Storm Systems

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

Outcomes:

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

- size building storm drains and storm drainage systems.
- install building storm drains and storm drainage systems.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-495 Commercial Drainage, Waste and Venting 1

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 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 sequencing 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

Outcomes:

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

- size commercial drainage systems.
- install drainage systems for commercial applications according to codes and regulations.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-500 Commercial Drainage, Waste and Venting 2

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe the components, purpose and applications of the following venting systems:
 - i) stacks over 3 storeys
 - ii) individual
 - iii) dual
 - iv) branch
 - v) header
 - vi) continuous
 - vii) vent stack
 - viii) relief vent
 - wet vents
 - stack offsets
 - ix) single story wet vent (over four fixtures)
3. Identify and interpret plumbing codes for commercial venting systems.
4. Describe the criteria and procedures for installation of:
 - i) vent pipes for traps
 - ii) miscellaneous vent pipes
 - iii) arrangement of vent pipes
 - iv) minimum size of vent pipes
5. Explain the procedures for connecting fixtures, offsets and vents to venting systems.
6. Describe the procedures used to install the various commercial vent systems.
 - i) material lists
 - ii) interference
 - iii) location and cutting of openings
 - iv) installation and support
 - v) protection
 - vi) testing and inspection
7. Describe the location and sizing of vent pipe terminals.
8. Describe the purpose and installation of fresh air inlets and building traps.
9. Describe the purpose and procedures for testing DWV systems.

Outcomes:

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

- size commercial venting systems.
- install venting systems for commercial applications according to codes and regulations.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-505 Commercial Drainage, Waste and Venting 3 (Commercial/Industrial)

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify and interpret applicable sections of the National Plumbing Code applicable to mobile home services.
3. Describe the purpose, components and sizing of relief vents for stacks over 11 storeys.
4. Describe the purpose and components of a municipal sewage system.
 - i) types of sewer
 - ii) construction and design
 - iii) grades and elevation
 - iv) methods of connection
5. Describe the purpose and design of waste water treatment plants.
 - i) methods of disposal
 - ii) methods of treatment
 - iii) lift stations
 - iv) piping materials and components
6. Describe the terminology, factors and procedures involved in sizing sewage pumps or receiving tanks.
 - i) capacity
 - ii) purpose
 - iii) application
 - iv) interpret plumbing code requirements
7. Describe the components and operation of sewage pumps or receiving tanks.
 - i) materials/covers
 - ii) types of pumps and components
 - iii) control/alarm
8. Describe the methods of installing and servicing sewage pumps and their components.
 - i) excavation/bedding/backfill
 - ii) pumps and their controllers
 - iii) floats and alarm
 - iv) troubleshooting
 - v) interpret codes and manufacturers' literature

9. Describe the procedures for connecting sewage sump drains.
 - i) to building drains
 - ii) arrangement of fittings
 - iii) sizing
 - iv) termination
10. Describe the terminology, purpose and applications associated with indirect wastes.
11. Describe the criteria used to size and install indirect piping connections and air breaks.
 - i) types of fixtures/equipment
 - ii) fixture outlet sizes
 - iii) material
 - iv) methods of support
 - v) venting of traps
 - vi) interpret plumbing code requirements
12. Describe the terminology, purpose and common types of interceptors.
 - i) oil/gas
 - ii) sediment/sand
13. Describe the methods of sizing, installing and servicing interceptors.
 - i) capacity
 - ii) purpose
 - iii) application
14. Describe the procedures used to connect drains and vents of interceptors to build drains, stacks, and branches.
 - i) arrangement of fittings
 - ii) sizing
 - iii) termination
15. Describe the methods of protecting plumbing systems from extreme conditions.
 - i) high temperature
 - ii) corrosive waste
16. Identify types of acid resistant piping systems and describe associated safety precautions and installation procedures.
 - i) acid resistant plastics
 - ii) glass
 - iii) duriron and teflon
 - iv) stainless steel

17. Describe the methods of treating corrosive waste before entering the plumbing system and explain the requirements for installation, sizing and venting.
- i) acid-dilution tanks
 - ii) neutralizing tanks

Outcomes:

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

- size building sewers and sanitary drainage systems for commercial/industrial applications according to code.
- demonstrate knowledge of the procedures to install venting systems for commercial/industrial applications according to code.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

1

PLG-510 Residential Appliances, Fixtures and Trim

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 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 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 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 installation and testing of laundry trays and washing machines.

PLUMBING ACCESSORIES

20. Describe the types of plumbing accessories, their characteristics and applications.
 - i) grab bars
 - ii) soap dispenser
 - iii) paper towel dispenser
 - iv) toilet paper holder
 - v) towel shelves
 - vi) towel pins
 - vii) single and double hooks
 - viii) soap holders and dishes
 - ix) paraplegic equipment
 - x) shower curtain rods
 - xi) 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.

Outcomes:

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

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

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-515 Commercial Appliances, Fixtures and Trim

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe the types of fixture carriers, their parts, characteristics and applications.
 - i) water closet connection
 - ii) urinal wall carrier
 - iii) lavatory supports
3. Describe and identify the sources of information relevant to installation.
 - i) drawings
 - ii) specifications
 - iii) manufacturers' literature
4. Describe carriers for batteries of fixtures.
 - i) determination of left-hand and right-hand systems
5. Describe typical installations.
 - i) residential
 - ii) commercial/industrial
6. Describe the various types of connections used for fixtures.
 - i) floor style back outlet closet connection
 - ii) lead pipe connection
 - iii) tapered thread connection
 - iv) o-ring seal connection
7. Describe the procedures used to install the following:
 - i) water closet carriers
 - ii) basin and sink carrier
 - iii) urinal carrier

Outcomes:

- Upon successful completion of this unit, the apprentice will be able to
- select, install plumbing fixtures, appliances and trim for a variety of commercial applications.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-520 Industrial/Commercial Appliances, Fixtures and Trim

Objectives and Content:

COMMERCIAL APPLIANCES

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify and interpret sources of information for installation of appliances.
 - i) drawings
 - ii) specifications
 - iii) manufacturer's literature
3. Identify types of dishwashers and describe their operation and procedures used for installation.
4. Identify types of automatic clothes washers and describe their operation and procedures used for installation.
5. Identify types of garbage disposal units and describe their operation and procedures used for installation.
6. Identify types of water stations and describe their operation and procedures used for installation.
7. Describe potential cross connections and effective preventative measures.
8. Identify and interpret the National Plumbing Code sections that apply to the installation and testing of commercial appliances.

INSTITUTIONAL AND INDUSTRIAL FIXTURES AND TRIM

9. Identify and interpret the National Building Code and National Plumbing Code sections which apply to the installation and testing of institutional and industrial fixtures and trim.
10. Identify and interpret sources of information for installations.
 - i) drawings
 - ii) specifications
 - iii) manufacturers' literature

11. Describe institutional and industrial fixtures and their characteristics.
- i) water closet (patients)
 - ii) water closet (specimen)
 - iii) lavatory (patients)
 - iv) lavatory (exam/treatment)
 - v) lavatory (general)
 - vi) bathtub
 - vii) sitz bath
 - viii) clinic service sink
 - ix) surgeon's scrub sink
 - x) eye wash
 - xi) emergency shower
 - xii) plaster sink
 - xiii) vacuum breaker
 - xiv) bedpan cleanser
 - xv) thermostatic mixing valve
 - xvi) pedal valve or stop
 - xvii) knee action mixing valve
 - xviii) shower head
 - xix) bradley wash fountain
 - xx) mop sinks
 - xxi) vandal proof fixtures and fittings
 - xxii) whirlpool bath
12. Describe procedures used to install institutional and industrial fixtures and trim.

Outcomes:

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

- demonstrate knowledge of the procedures to select and install plumbing fixtures, appliances and trim for a variety of commercial/Industrial applications.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.
Practical Projects include:

- 1.

PLG-525 Rural Waste Disposal

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 & 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

Outcomes:

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

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

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-530 Lawn Sprinkler Systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Describe the component parts of a lawn sprinkler system, their purpose and operation.
 - i) spray heads
 - ii) draining points
 - iii) valves
 - iv) chemical fertilizer injectors
 - v) water supply connections
3. Identify and interpret sources of information pertaining to lawn sprinkler systems.
 - i) drawings
 - ii) specifications
 - iii) manufacturers' literature
4. Describe the types of pipes and fittings used in lawn sprinkler systems.
5. Describe potential dangers from cross connection and methods used to eliminate them.
6. Describe the procedures required to install lawn sprinkler systems.

Outcomes:

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

- demonstrate knowledge of the installation of lawn sprinkler systems and equipment.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLG-535 Swimming Pool Systems

Objectives and Content:

1. Identify and interpret applicable sections of the National Plumbing Code.
2. Identify and interpret sources of information pertaining to installation.
 - i) drawings
 - ii) specifications
 - iii) manufacturers' literature
3. Describe a typical swimming pool installation, the component parts and operation.
 - i) piping
 - ii) skimmer
 - iii) hair and lint strainer
 - iv) filter pump
 - v) circulating pump
 - vi) filter
 - vii) chlorinator
 - viii) pool heater
 - ix) controls
4. Describe skimmers, their location and operation.
 - i) residential installation
 - ii) normal skimming operation
 - iii) safety by-pass operation
 - iv) skimmers and accessories
5. Describe hair and lint strainers, their location and operation.
 - i) typical types of hair and lint strainers
 - ii) layout of plumbing
6. Identify types of filter systems and describe their location and operation.
 - i) operating principle
 - ii) types of installations
 - iii) cleaning the filter
 - iv) two tank battery system
 - v) single tank systems
 - vi) multiple-battery system
7. Identify types of filter pumps and describe their parts and operation.

8. Describe vacuum systems, their parts and operation.
9. Describe methods of heating swimming pools.
 - i) gas
 - ii) electric
 - iii) solar
 - iv) heat exchangers
 - v) heat pumps
10. Describe chlorinators, their purpose and operation.
11. Describe flowmeters, their purpose and operation.
12. Describe the procedures used to install swimming pool piping and accessories.

Outcomes:

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

- demonstrate knowledge of installation of swimming pool systems and equipment.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.
Practical Projects include:

- 1.

PLG-1127 Drainage and Venting Systems 2C (Commercial Venting)

Objectives and Content:

1. Describe the components and function of the following venting systems:
 - i) stack
 - ii) individual
 - iii) dual
 - iv) branch
 - v) header
 - vi) continuous
 - vii) vent stack
 - viii) relief vent
 - ix) combined relief vents
 - x) single story wet venting (over four fixtures)
 - xi) multi-story wet vent
2. Identify and interpret plumbing codes for commercial venting systems.
3. Describe the procedures for sizing the following venting systems:
 - i) interpret plumbing code requirements electric
 - ii) stack
 - iii) individual
 - iv) dual
 - v) branch
 - vi) header
 - vii) continuous
 - viii) vent stack
 - ix) relief vent and combined relief vents
 - x) single storey wet venting (over four fixtures)
4. Describe the criteria, code requirements and procedures for installation of:
 - i) vent pipes for traps
 - ii) miscellaneous vent pipes
 - iii) arrangement of vent pipes
 - iv) minimum size of vent pipes
5. Explain the procedures and rules for connecting fixtures, offsets and vents to venting systems.

6. Describe the procedures used to install the various commercial vent systems.
 - i) material lists
 - ii) Interference
 - iii) location and cutting of openings
 - iv) installation and support
 - v) protection
 - vi) testing and inspection
7. Describe the location and sizing of vent pipe terminals.
8. Describe the purpose and installation of fresh air inlets.

Outcomes:

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

- size commercial venting systems.
- install venting systems for commercial applications according to codes and regulations.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

1. Perform material list take off from plans.
2. Size commercial venting systems.
3. Install and test commercial venting systems according to code.
4. Calculate vent height connections.

Objectives and Content:

1. Describe occupational health and safety rules as outlined in the act and regulations.
2. Describe good housekeeping practices.
3. Describe correct procedure for the reporting of accidents.
4. Identify personal safety equipment and describe the correct procedures for its use and care.
 - safety hats
 - gloves
 - safety shoes
 - safety glasses
 - respirators
5. Describe practices for working safely:
 - with welding equipment
 - near pressurized or high temperature systems
 - in confined spaces
6. Describe the procedures for working safely with ladders and scaffolds.
7. Describe the WHMIS system, its purpose and use.
8. Explain the function and use of MSDS Sheets.
9. Describe the correct use and applications of various types of fire fighting equipment.
10. Describe the dangers presented by electrical hazard.
11. Describe basic electrical safety procedures.
12. Describe the procedure to be followed in the event of a person receiving an electrical shock.
13. Describe the purpose and rules for lockout/tagout procedures.

Outcomes:

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

- practice safety.
- maintain a safe work environment.
- select, use and maintain personal protective clothing and equipment.

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

1. Classroom exercises as determined by the instructor.

PLGA-1002

Math 1

(Nova Scotia Unit of Instruction)

Objectives and Content:

Outcomes:

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

-

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

1. Classroom exercises as determined by the instructor.

PLGA-1003

Water Pipe Sizing

(Nova Scotia Unit of Instruction)

Objectives and Content:

1. Design water piping layout for commercial and industrial applications.
2. Describe procedures used to install Primary relief valves for industrial applications
3. Size water pipe according to National Plumbing Code.
4. Describe procedures used in install Booster Pump systems.

Outcomes:

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

- demonstrate knowledge of water piping requirements and sizing for industrial applications

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

- 1.

PLGA-1004

Math 2

(Nova Scotia Unit of Instruction)

Objectives and Content:

Outcomes:

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

-

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

1. Classroom exercises as determined by the instructor.

PLGA-1005

Cross Connection Control Test Procedures

(Nova Scotia Unit of Instruction)

Objectives and Content:

Outcomes:

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

-

Practical Projects:

Practical skills enhance the apprentices' ability to meet the objectives of the unit.

Practical Projects include:

1. Classroom exercises as determined by the instructor

PLGA-1844 Program Review
(Nova Scotia Unit of Instruction)

Learning Outcomes:

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

Objectives and Content:

1. Identify areas of the program where knowledge of theory is weakest.
2. Identify areas where workplace experience is lacking or weak.
3. Identify resources necessary to address areas of shortfall.
4. Identify timelines to address areas of weakness.

Suggested Learning Activities:

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

Resources:

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

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

Evaluation: pass/fail

MENT-1801

Workplace Mentoring I (Nova Scotia Unit of Instruction)

Learning Outcomes:

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

Objectives and Content:

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

Resource:

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

MENT-1802

Workplace Mentoring II (Nova Scotia Unit of Instruction)

Learning Outcomes:

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

Objectives and Content:

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

Resource:

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

Nova Scotia Document Evaluation Form

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

- course division and organization
- relevancy of the content
- errors or omissions
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