Saskatchewan Apprenticeship and Trade Certification Commission

Plumber

On-the-Job Training Guide

2020

Online: www.saskapprenticeship.ca

Recognition:
To promote transparency and consistency, portions of this document has been adapted from the 2016 Plumber Red Seal Occupational Standard (Employment and Social Development Canada).

A complete version of the Occupational Standard can be found at www.red-seal.ca

STRUCTURE OF THE ON-THE-JOB TRAINING GUIDE

To facilitate understanding of the occupation, this on-the-job training guide contains the following sections:

Description of the Plumber trade: an overview of the trade's duties and training requirements.

Essential Skills Summary: an overview of how each of the 9 essential skills is applied in this trade.

Harmonization: a brief description on the pan-Canadian Harmonization Initiative for the Plumber trade.

Task Matrix: a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard detailing the essential skills and the level of training where the content is covered.

Major Work Activity (MWA): the largest division within the standard that is comprised of a distinct set of trade activities.

Task: distinct actions that describe the activities within a major work activity.

Sub-task: distinct actions that describe the activities within a task.

On-the-Job and In-school Training Content for the Plumber Trade: a chart which outlines on-the-job examples for apprentices to achieve relevant work experience to prepare for topics of technical training.

DESCRIPTION OF THE PLUMBER TRADE

Plumbers install, replace and maintain water and sewage systems, and hydronic heating systems in residential, commercial and industrial buildings. They may also be licensed to perform gasfitting work.

Plumbers may be employed by plumbing/mechanical contractors, service companies, and maintenance departments of manufacturing, commercial, health care and educational facilities. They may also be self-employed. Plumbers install piping and equipment in residential, commercial, institutional and industrial buildings and sites.

Plumbers use a variety of tools and equipment such as hand and power tools, welding and soldering/brazing equipment, and hoisting and lifting equipment to perform the tasks in their trade. To perform some tasks or use some equipment, specific certification may be required. Plumbers work with a variety of piping materials such as copper, steel, plastic, glass, cast iron, cement, fibreglass and specialty materials. Before assembling and fitting pipe sections, tubing and fittings, the pipes must be measured, cut and bent as required. Joining pipe may be done by various means, such as threading, using mechanical joints, welding, soldering/brazing and using fastening materials and compounds. Plumbers test and commission systems to ensure proper operation. They perform scheduled, unscheduled and emergency maintenance and repair.

Safety awareness is essential for plumbers. They may work indoors or outdoors and working conditions vary from one job to another. The work of plumbers can be physically demanding. Plumbers often need to lift and carry heavy materials and equipment. While performing their duties, plumbers are also required to do considerable standing, climbing and kneeling. They may work at heights and in confined spaces. Special precautions may have to be taken when working with fluids, gases, steam and hazardous elements. Plumbers need to assess the systems and the environment to identify possible dangers.

Key attributes for people entering this trade are good mechanical, mathematical and spatial visualization skills. Plumbers also need good communication skills to communicate with co-workers and clients. Analytical/problem solving skills are required to interpret building plans, inspect piping systems and diagnose system faults and/or malfunctions.

With experience, plumbers act as mentors and trainers to apprentices in the trade. They may also move into other positions such as instructors, inspectors, estimators and project managers.

Training Requirements: 7200 hours and 4 years, including two 8-week and two 7-week training sessions delivered by Saskatchewan Polytechnic in Saskatoon. Level one and two are also delivered by Saskatchewan Polytechnic in Regina.

Journeyperson to apprentice ratio for this trade is: 1:2

The information contained in this document serves as a guide for employers and apprentices. Apprenticeship training is mutually beneficial to both employer and apprentice. The employer's investment in training apprentices results in skilled and certified workers. The document summarizes the tasks to be covered by the apprentice during their on-the-job portion of apprenticeship training. An apprentice spends approximately 85% of their apprenticeship term training on-the-job.

It is the employer's or journeyperson's responsibility to supervise an apprentice's practical skills development until a satisfactory level of proficiency has been reached.

EMPLOYER TRAINING RESPONSIBILITY

- promote a safety-conscious workplace

- provide mentored, hands-on practice in the use of tools and equipment
- demonstrate procedures relevant to the installation of drainage, waste and vent systems; potable water distribution; fixtures and appliances; hydronic heating and cooling systems; specialty piping; pumps and private sewage disposal systems
- provide the opportunity for apprentices to service the above systems and products
- further the apprentice's ability to interpret technical drawings
- ensure that the apprentice can evaluate the end product.

Employers should make every effort to expose their apprentices to work experience in as many areas of the trade as possible.

In the On-the-Job Training Guide, in-school instruction is listed first; on-the-job suggestions to help employers assist the apprentice to prepare for in-school training are listed next.

The content of the training components is subject to change without notice.

Entrance Requirements for Apprenticeship Training

Your grade twelve transcript (with no modified classes) or GED 12 is your guarantee that you meet the educational entrance requirements for apprenticeship in Saskatchewan. In fact, employers prefer and recommend apprentices who have completed high school. This ensures the individual has all of the necessary skills required to successfully complete the apprenticeship program, and receive journeyperson certification.

Individuals with "modified" or "general" classes in math or science do not meet our entry requirements. These individuals are required to take an entrance assessment prescribed by the SATCC.

English is the language of instruction in all apprenticeship programs and is the common language for business in Saskatchewan. Before admission, all apprentices and/or "upgraders" must be able to understand and communicate in the English language. Applicants whose first language is not English must have a minimum Canadian Language Benchmark Assessment of six (CLB6).

Note: A CLB assessment is valid for a one-year period from date of issue.

Designated Trade Name	**Math Credit** at the Indicated Grade Level❶	**Science Credit** at Grade Level
Plumber	Grade 10	Grade 10

❶ - (One of the following) WA – Workplace and Apprenticeship; or F – Foundations; or P – Pre-calculus, or a Math at the indicated grade level (Modified and General Math credits are not acceptable.).

*Applicants who have graduated in advance of 2015-2016, or who do not have access to the revised Science curricula will require a Science at the minimum grade level indicated by trade.

For information about high school curriculum, including Math and Science course names, please see: http://www.curriculum.gov.sk.ca/#

Individuals not meeting the entrance requirements will be subject to an assessment and any required training

ESSENTIAL SKILLS SUMMARY

Essential skills are needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in nearly every occupation and throughout daily life in different ways.

A series of CCDA-endorsed tools have been developed to support apprentices in their training and to be better prepared for a career in the trades. The tools can be used independently or with the assistance of a tradesperson, trainer, employer, teacher or mentor to:

- understand how essential skills are used in the trades;
- learn about individual essential skills strengths and areas for improvement; and
- improve essential skills and increase success in an apprenticeship program.

The tools are available online or for order at: www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml

The application of these skills may be described throughout this document within the skills and knowledge which support each sub-task of the trade. The most important essential skills for each sub-task have also been identified. The following are summaries of the requirements in each of the essential skills, taken from the essential skills profile. A link to the complete essential skills profile can be found at www.red-seal.ca.

READING

Plumbers require strong reading skills to consult installation procedures, reference manuals, Safety Data Sheets (SDS), the National Plumbing Code (NPC) and industry standards and safety requirements when installing, repairing and maintaining plumbing fixtures and systems. They also refer to project specifications and work orders when planning a job.

DOCUMENT USE

Document use is important in the work of plumbers. Plumbers interpret diagrams in the NPC to ensure compliance with regulatory standards. They interpret schematics and working drawings when planning the installation of piping systems. Plumbers read assembly drawings to install fixtures and appliances. They prepare sketches and drawings to plan a job.

WRITING

Writing skills are used by plumbers to perform tasks such as writing lists of materials required for a job, completing order forms to request materials, and keeping daily logs to track work status and reminders. When required, they must write incident or accident reports. They may be required to communicate in writing to other trade professionals such as engineers and architects.

ORAL COMMUNICATION

Plumbers require good oral communication skills to interact with colleagues, apprentices, supervisors, suppliers, inspectors, clients and other tradespersons when co-ordinating work, resolving problems and ensuring safety.

NUMERACY

Plumbers work in both imperial and metric systems of measurement. They locate and mark positions for pipe connections. They perform a variety of calculations such as offsets, drain line fall, hydraulic load, and temperature and pressure calculations depending on the type of piping system being installed. Plumbers estimate materials and supplies needed to complete a project. They may estimate labour requirements and prepare quotations and invoices.

THINKING

Plumbers diagnose and solve problems. They decide on work priorities and plan and organize their work accordingly. Plumbers may determine the most cost effective way to use materials and supplies when installing plumbing and heating systems.

WORKING WITH OTHERS

During the course of a work day, plumbers must interact with others such as co-workers, suppliers, clients and other trades.

DIGITAL TECHNOLOGY

Plumbers use computers and other digital devices more commonly as sources of resource information, communication and cost reporting. They are also used as a tool for design, layout, research, system diagnosis and estimating.

CONTINUOUS LEARNING

Changes to the NPC periodically modify procedures and methods for the design and installation of piping systems. Advances in technology are also changing the design, applications and materials of systems. There is an increased emphasis on worker health and safety. All these changes mean that related training and certification is often mandatory for both apprentices and journeypersons.

HARMONIZATION

At the request of industry, the Harmonization Initiative was launched in 2013 to *substantively align* apprenticeship systems across Canada by making training requirements more consistent in the Red Seal trades. Harmonization aims to improve the mobility of apprentices, support an increase in their completion rates and enable employers to access a larger pool of apprentices.

As part of this work, the Canadian Council of the Directors of Apprenticeship (CCDA) identified four main harmonization priorities in consultation with industry and training stakeholders:

1. Trade name

The official Red Seal name for this trade is Plumber.

2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for the Plumber trade is 4.

3. Total Training Hours during Apprenticeship Training

The total hours of training, including both on-the-job and in-school training for the Plumber trade is 7200.

4. Consistent sequencing of training content (at each level) using the most recent Occupational Standard

Implementation for harmonization will take place progressively. Level one to be implemented in 2017/2018, level two 2018/2019, level three 2019/2020, and level four in 2020/2021.

PLUMBER TASK MATRIX CHART

This chart outlines the major work activities, tasks and sub-tasks from the 2016 Plumber Red Seal Occupational Standard. Each sub-task details the corresponding essential skill and level of training where the content is covered*.

* Sub-tasks with numbers in the boxes is where the content will be delivered in technical training. The Task Matrix Chart will be updated every year until Harmonization implementation is complete. Implementation for harmonization will take place progressively. Level one to be implemented in 2017/2018, level two 2018/2019, level three 2019/2020, and level four in 2020/2021.

A - PERFORMS COMMON OCCUPATIONAL SKILLS

A-1 Performs safety-related functions	**1.01 Maintains safe work environment** **1**	**1.02 Uses personal protective equipment (PPE) and safety equipment** **1**	**1.03 Performs lock-out and tag-out procedures** **1**		
A-2 Uses and maintains tools and equipment	**2.01 Uses common tools and equipment** **1** **2,3,4 In Context**	**2.02 Uses access equipment** **1** **2,3,4 In Context**	**2.03 Uses rigging, hoisting, lifting and positioning equipment** **1** **2,3,4 In Context**	**2.04 Rigs loads for cranes** **1** **2,3,4 In Context**	**2.05 Uses welding equipment** **1** **2,3,4 In Context**
	2.06 Uses soldering and brazing equipment **1** **2,3,4 In Context**	**2.07 Uses oxy-fuel equipment** **1** **2,3,4 In Context**			
A-3 Organizes work	**3.01 Organizes project tasks and procedures** **1,2,3,4 In Context**	**3.02 Organizes materials and supplies** **1,2,3,4 In Context**			
A-4 Performs routine trade activities	**4.01 Performs piping system layout** **1,2** **3,4 In Context**	**4.02 Calculates pipe, tube and tubing lengths** **1,2** **3,4 In Context**	**4.03 Calculates piping offsets** **1,2** **3,4 In Context**	**4.04 Installs piping supports** **1,2** **3,4 In Context**	**4.05 Installs sleeves** **1,2** **3,4 In context**

	4.06 Commissions systems 1,2 3,4 In Context	4.07 Protects piping systems, equipment and structure from damage 1,2 3,4 In Context	4.08 Coordinates excavation and backfilling of trenches 1,2 3,4 In Context	4.09 Installs fire stopping devices and materials 1,2 3,4 In Context
A-5 Uses communication and mentoring techniques	5.01 Uses communication techniques 1	5.02 Uses mentoring techniques 2		

B – PREPARES AND ASSEMBLES PIPE

B-6 Prepares pipe	6.01 Inspects tube, tubing, pipe and fittings before installation 1 2,3,4 In context	6.02 Cuts tube, tubing and pipe 1 2,3,4 In Context	6.03 Bends tube, tubing and pipe 1 2,3,4 In Context	6.04 Prepares tube, tubing and pipe connections 1 2,3,4 In context	
B-7 Joins tube, tubing and pipe	7.01 Joins copper tube, tubing and pipe 1 2,3,4 In Context	7.02 Joins plastic pipe and tubing 1 2,3,4 In Context	7.03 Joins steel pipe 1 2,3,4 In Context	7.04 Joins cast iron pipe 1 2,3,4 In Context	7.05 Joins specialized pipe 1 2,3,4 In Context

C – INSTALLS, TESTS AND SERVICES SEWERS, SEWAGE TREATMENT SYSTEMS AND DRAINAGE, WASTE AND VENT (DWV) SYSTEMS

C-8 Installs, tests and services sewers	**8.01 Sizes pipe for sewers** **3**	**8.02 Installs manholes and catch basins** **3**	**8.03 Installs piping for sewers** **3**	**8.04 Tests manholes, catch basins and piping for sewers** **3**	**8.05 Services manholes, catch basins and piping for sewers** **3**
C-9 Installs, tests and services sewage treatment systems	**9.01 Plans installation of sewage treatment systems** **4**	**9.02 Installs sewage treatment system components** **4**	**9.03 Tests sewage treatment systems and components** **4**	**9.04 Services sewage treatment systems and components** **4**	
C-10 Installs, tests and services interior drainage, waste and vent (DWV) systems	**10.01 Sizes pipe for interior drainage, waste and vent (DWV) systems** **1,2,3** **4 in Context**	**10.02 Installs underground piping and components for interior drainage, waste and vent (DWV) systems** **1,2,3** **4 in Context**	**10.03 Installs piping and components for interior drainage, waste and vent (DWV) systems above-ground** **1,2,3** **4 in Context**	**10.04 Tests interior drainage, waste and vent (DWV) systems** **1,2,3** **4 in Context**	**10.05 Services piping and components for interior drainage, waste and vent (DWV) systems** **1,2,3** **4 in Context**

D – INSTALLS, TESTS AND SERVICES WATER SERVICE AND DISTRIBUTION

D-11 Installs, tests and services water services	**11.01 Sizes pipe for water services** 3	**11.02 Installs piping for water services** 3	**11.03 Installs water service equipment** 3	**11.04 Tests water service piping and components** 3	**11.05 Services water services** 3
D-12 Installs, tests and services potable water distribution systems	**12.01 Sizes piping and equipment for potable water distribution systems** 3 4 in Context	**12.02 Installs piping for potable water distribution systems** 3 4 in Context	**12.03 Installs potable water distribution equipment** 3 4 in Context	**12.04 Installs and uses cross-connection control devices and methods** 3 4 in Context	**12.05 Tests potable water distribution systems** 3 4 in Context
	12.06 Services potable water distribution systems 3 4 in Context				
D-13 Installs, tests and services pressure systems	**13.01 Sizes pressure systems** 4	**13.02 Installs piping for pressure systems** 4	**13.03 Installs equipment and components for pressure systems** 4	**13.04 Tests pressure systems** 4	**13.05 Services pressure systems** 4

E – INSTALLS, TESTS AND SERVICES FIXTURES, APPLIANCES AND WATER TREATMENT SYSTEMS

E-14 Installs, tests and services plumbing fixtures and appliances	**14.01 Installs fixture supports** **2** **3 In Context**	**14.02 Installs plumbing fixtures and appliances** **2** **3 In Context**	**14.03 Tests plumbing fixtures and appliances** **2** **3 In Context**	**14.04 Services plumbing fixtures and appliances** **2** **3 In Context**
E-15 Installs, tests and services water treatment equipment	**15.01 Sizes water treatment equipment** **4**	**15.02 Installs water treatment equipment** **4**	**15.03 Tests water treatment equipment** **4**	**15.04 Services water treatment equipment** **4**

F – INSTALLS, TESTS AND SERVICES LOW PRESSURE STEAM AND HYDRONIC HEATING AND COOLING SYSTEMS

F-16 Installs, tests and services low pressure steam systems	**16.01 Sizes piping and components for low pressure steam systems** **4**	**16.02 Installs piping and components for low pressure steam systems** **4**	**16.03 Tests piping and components for low pressure steam systems** **4**	**16.04 Services piping and components for low pressure steam systems** **4**
F-17 Installs, tests and services hydronic heating and cooling piping systems	**17.01 Sizes piping and components for hydronic systems** **2,3** **4 in Context**	**17.02 Installs piping and components for hydronic systems** **2,3** **4 in Context**	**17.03 Tests piping and components for hydronic systems** **2,3** **4 in Context**	**17.04 Services piping and components for hydronic systems** **2,3** **4 in Context**
F-18 Installs, tests and services hydronic heating and cooling generating systems	**18.01 Installs hydronic heating generating systems** **2,3** **4 in context**	**18.02 Installs hydronic cooling generating systems** **2,3** **4 in Context**	**18.03 Tests hydronic heating and cooling generating systems** **2,3** **4 in Context**	**18.04 Services hydronic heating and cooling generating systems** **2,3** **4 in Context**

F-19 Installs, tests and services hydronic system controls and transfer units	**19.01 Installs hydronic system controls** **2,3** **4 in Context**	**19.02 Installs hydronic transfer units** **2,3** **4 in Context**	**19.03 Tests hydronic system controls and transfer units** **2,3** **4 in Context**	**19.04 Services hydronic system controls and transfer units** **2,3** **4 in Context**

G – INSTALLS, TESTS AND SERVICES FIRE PROTECTION SYSTEMS (NOT COMMON CORE)

This Major Work Activity is not consistently performed by Plumbers across Canada, therefore this content is deemed not common core and will not be assessed on the Plumber certification examination.

G-20 Installs, tests and services flow-through fire protection systems (Not Common Core)	**20.01 Installs flow-through fire protection systems (Not Common Core)**	**20.02 Tests flow-through fire protection systems (Not Common Core)**	**20.03 Services flow-through fire protection systems (Not Common Core)**
G-21 Installs, tests and services standpipe systems (Not Common Core)	**21.01 Installs piping and equipment for standpipe systems (Not Common Core)**	**21.02. Tests standpipe systems (Not Common Core)**	**21.03. Services standpipe systems (Not Common Core)**

H – INSTALLS, TESTS AND SERVICES SPECIALIZED SYSTEMS

H-22 Installs, tests and services specialized systems	**22.01 Installs piping for specialized systems** **3,4**	**22.02 Installs equipment and components for specialized systems** **3,4**	**22.03 Tests specialized systems** **3,4**	**22.04 Services specialized systems** **3,4**
H-23 Installs, tests and services process piping systems	**23.01 Installs piping for process piping systems** **4**	**23.02 Installs equipment and components for process piping systems** **4**	**23.03 Tests process piping systems** **4**	**23.04 Services process piping systems** **4**

ON-THE JOB AND IN-SCHOOL TRAINING CONTENT FOR THE PLUMBER TRADE

This chart outlines on-the-job examples for apprentices to achieve relevant work experience to prepare for the topics of technical training. Topics of technical training are provided with the associated learning outcomes.

Level One — 8 weeks — 240 hours

Trade Relate Safety – Theory — 15 hours

- discuss safe work practices
- discuss WHMIS
- discuss lockout and tag out procedures

Trade Related Safety – Shop — 15 hours

- demonstrate safe work practices
- apply WHMIS
- perform lockout and tag out procedures

Mentors can assist the apprentice to prepare for this section of technical training by:

- *attending shop safety meetings*
- *insisting on appropriate work clothes and personal protective equipment*
- *having the apprentice attend training for WHMIS*
- *demonstrate how lock out and tag out procedures work and why*

Introduction to Graphics — 30 hours

- explain drafting tools
- use drafting tools
- discuss graphics language, measurements and standards
- explain graphical single line projections
- draw single line projections

Mentors can assist the apprentice to prepare for this section of technical training by:

- *reviewing and explaining on-site blueprints and shop drawings discussing what different symbols mean*
- *explaining and demonstrating how a scale ruler is used and interpreted*
- *demonstrating how on-site blueprints and hand-drawn isometric drawings are used for material take-off*

Basic Tools and Equipment – Theory — 30 hours

- discuss the use and care of hand and power tools
- discuss access equipment
- explain hoisting and rigging equipment
- explain crane hand signals
- discuss knots and hitches
- describe welding equipment
- explain soldering and brazing equipment

Basic Tools and Equipment – Shop — 30 hours

- demonstrate the safe use and care of hand and power tools
- demonstrate access equipment use

- use hoisting and rigging equipment
- use crane hand signals
- tie knots and hitches
- use welding equipment
- perform soldering and brazing

Mentors can assist the apprentice to prepare for this section of technical training by:

- *spending time explaining what each tool is used for and demonstrating the proper use*
- *making the apprentice perform a shop inventory to learn the proper names of materials and tools*
- *demonstrating safe work habits regarding trenching, confined spaces, ladders and scaffolds*
- *having the apprentice participate in lifting procedures, explaining how and when clevises, slings and other rigging equipment is used*
- *demonstrating, then supervising the apprentice during actual lifts of materials and equipment for crane hand signalling procedures*
- *demonstrating how knots are tied and when each should be used*

Piping Fundamentals – Theory — 30 hours

- discuss piping system layout
- discuss piping system measurements
- explain piping system offsets
- identify pipe support systems
- discuss pipe sleeves
- define piping system commissioning
- discuss piping system protection

Piping Fundamentals – Shop — 30 hours

- assemble copper tube and tubing
- assemble plastic tube and tubing
- assemble steel pipe project
- install a hybrid piping system

Mentors can assist the apprentice to prepare for this section of technical training by:

- *assisting the apprentice to identify the various fittings found in the shop and describing their use*
- *demonstrating the proper procedure for jointing of all piping materials and the bending and flaring of copper tube, then allowing time for the apprentice to practice these techniques on scrap materials*
- *having the apprentice repetitively perform tasks required to work with these materials*
- *describing the various types of piping supports and hangars and demonstrating their installation procedures*
- *demonstrating how piping support frequency is calculated using the code book*
- *demonstrating the proper procedure to join copper pipe using the appropriate solder and flux*
- *demonstrate the proper procedure to join plastic tube and tubing*
- *demonstrate the proper procedure to join steel*

Plumbing Codebook — 30 hours

- explain drainage piping components
- explain dry venting
- explain wet venting
- size drainage, waste and venting (DWV) line drawings
- discuss rough-in requirements
- install bathroom rough-in

Mentors can assist the apprentice to prepare for this section of technical training by:

- *performing the work referring to a code book, demonstrating how it is used and interpreted*
- *describe and show the apprentice different types of venting and their functions*
- *have the apprentice use the code book to size drainage, waste and venting lines*
- *have the apprentice involved in bathroom rough-ins on the job*

Gasfitting **30 hours**

- explain the delivery system for natural and propane gases
- discuss the properties of natural, propane and butane gases
- explain gas codes
- install a natural gas piping system
- commission a natural gas piping system

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining the gasfitting basics regarding safety and terminology*
- *allowing the apprentice to clock a meter to determine gas consumption*
- *allowing the apprentice to check gas pressures*
- *demonstrating how a code book is used and interpreted by having the apprentice find relevant code references as an exercise*
- *having the apprentice assist in the installation, service, testing and repair of domestic natural gas piping systems*

Level Two 8 weeks 240 hours

Plumbing Systems – Theory **27 hours**

- describe potable water distribution systems
- distinguish different piping materials for drainage, waste and vent and potable water systems
- discuss piping system protection
- discuss fire stopping materials
- explain fixtures and trim

Plumbing Systems – Shop **27 hours**

- plan piping system layout
- size piping system layout
- install rough-in plumbing
- install fixtures and trim
- Test drainage, waste and venting (DWV) and potable water systems
- Inspect DWV and potable water systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explain the various piping materials used for domestic piping systems*
- *exposing the apprentice to various types of domestic plumbing fixtures*
- *explaining what the purpose of each system (DWV) is used for*
- *explaining why there are different size requirements*
- *demonstrating proper piping practices*
- *having the apprentice size and locate cleanouts*
- *having the apprentice fully participate in the rough and finished testing of systems*
- *assisting the apprentice to size a potable water system*
- *having the apprentice install water closets, sinks, basins, bathtubs and showers from rough-in trim*

- *allowing the apprentice to install all types of piping, not just making the holes or digging the trenches*
- *explaining the requirements and restrictions for system installations with respect to appropriate permits and drawings*
- *allowing the apprentice to work on residential, commercial and industrial installations, if possible*

Hydronic Systems - Theory — 47 hours

- explain the chemical and physical properties of water
- perform mathematical calculations
- describe boilers
- describe boiler trim
- explain circulating pump components
- describe zoning
- describe piping layouts
- discuss heat emitters

Hydronic Systems - Shop — 7 hours

- identify boiler trim components
- interpret circulating pump curves
- operate hydronic systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explain the various components of a boiler and their functions*
- *have apprentice install and service boilers*
- *have apprentice install and service hydronic heating systems and components*
- *explain circulators and how they are chosen to meet different system demands*
- *explain calculations for finding the volume of glycol required for a particular system*

Plumbing Codebook – Theory — 27 hours

- demonstrate orthographic projections
- demonstrate isometric projections
- apply codebook objectives for drainage, waste and venting (DWV) systems
- explain blueprints
- explain building specifications

Plumbing Codebook – Shop — 27 hours

- construct an orthographic drawing using an isometric template
- construct an isometric drawing using an orthographic template
- perform mathematical calculations
- demonstrate the relationship between the plumbing code, blueprints and specifications
- size drainage, waste and vent (DWV) systems
- draw DWV single line piping systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *ensure the apprentice can identify, name and size the drains and vents that make up a residential or light commercial plumbing system*
- *encourage the apprentice to make isometric drawings to accompany any material lists*
- *assist the apprentice to understand how to establish grades and elevations from a drawing*
- *supervising the apprentice to calculate the requirements, according to code, for small jobs*
- *allowing the apprentice to make out the material lists for smaller projects*
- *explain the importance of grades and elevation calculations*

- *expose the apprentice to the different sections of a set of blueprints and the information that can be found in each section*

Gasfitting – Theory (Exceed) **42 hours**

- discuss line sizing techniques for piping systems operating at two pounds per square inch and less
- discuss the combustion process pertaining to gas appliances
- perform mathematical calculations
- apply the B149.1 and B149.2 national and provincial codes
- describe gas burners
- explain domestic controls

Gasfitting – Shop (Exceed) **12 hours**

- layout gas distribution piping system
- layout the venting system
- apply manufacturers' guidelines for furnace positioning
- perform start up procedures

Mentors can assist the apprentice to prepare for this section of technical training by:

- *having the apprentice assist in the sizing of low and high pressure gas piping systems*
- *explaining the combustions process for natural and propane gases*
- *continuing to further the apprentices ability to interpret the gas codes for both natural and propane gases*
- *demonstrating the operation, adjustment and servicing of atmospheric burners*
- *explaining series and parallel circuits*
- *assisting the apprentice to understand meter use while testing domestic controls and electrical systems*
- *exposing the apprentice to various flame safeguard systems*
- *having the apprentice assist in the installation of domestic appliances*
- *having the apprentice assist in the start-up of domestic appliances*

Electric Controls (Exceed) **24 hours**

- describe basic electrical concepts.
- measure voltage, current, resistance, and capacitance.
- interpret wiring diagrams.
- test standing pilot appliance controls.
- terminate wires.

Mentors can assist the apprentice to prepare for this section of technical training by:

- *explaining wiring diagrams and assisting the apprentice to analyze series and parallel circuits*
- *discussing the applications for different meters and demonstrating how they are used*
- *explaining how equipment controls are serviced*
- *supervising hands-on experience in electrical troubleshooting*
- *allowing the apprentice to attend manufacturer's seminars*

Level Three 7 weeks 210 hours

Plumbing Codebook **54 hours**

- demonstrate non-isometric lines
- identify procedures for establishing elevations with the builder's level

- identify procedures for establishing elevations with the laser level
- size storm drainage systems
- calculate grade and elevation
- solve sanitary drainage, waste and venting scenarios
- plumbing codebook

Mentors can assist the apprentice to prepare for this section of technical training by:

- *continually referring to the code book to identify the parts of plumbing systems*
- *allowing the apprentice time to fully read the manufacturer's installation procedures for all installations*
- *supervising the apprentice during various commercial potable water systems and describing the basic operation*
- *giving the apprentice exposure to the installation and service of commercial systems from start to finish*
- *assisting the apprentice to size a commercial water supply piping system according to code*
- *demonstrating the use of a builder's level and laser level to establish elevations*
- *assisting the apprentice in sizing DWV and storm drainage systems*

Hydronic Systems — 27 hours

- discuss pump sciences
- calculate circulator requirements
- explain radiant heating concepts
- discuss piping strategy for multi temperature applications
- discuss design requirements for radiant panel heating systems
- recognize control systems
- discuss hydronic heating and cooling distribution piping

Mentors can assist the apprentice to prepare for this section of technical training by:

- *discussing with the apprentice the operation of circulators and how to choose the correct model*
- *explaining radiant heating system layout and operation*
- *assisting the apprentice in the installation of a hydronic heating system*
- *discussing the common controls and components of a hydronic heating system*
- *assist the apprentice in the commissioning of a hydronic system*

Gasfitting — 54 hours

- apply line sizing techniques for piping systems operating at two pounds per square inch and less
- analyze the air supply requirements for gas appliances
- categorize domestic gas fired equipment based on flue loss and draft characteristics
- interpret combustion air code requirements for appliances with inputs of 400 MBH or less
- interpret code requirements for flue gas removal from gas appliances
- examine category one vent system requirements
- size domestic gas line
- determine combustion air opening sizes for Category 1 appliances
- size vent, vent connectors and common vent connectors for Category 1 appliances
- interpret electrical control diagrams

Mentors can assist the apprentice to prepare for this section of technical training by:

- *allowing the apprentice to size low and high pressure gas systems*

- *having the apprentice calculate the combustion and ventilation requirements on various installations*
- *demonstrating a flue gas analysis*
- *continuing to further the apprentice's ability to interpret the gas codes for both natural and propane gases*
- *assisting the apprentice to size the ventilation and combustion air required for high input appliances*
- *allowing the apprentice to assist in the installation of category I appliance venting*
- *exposing the apprentice to various ignition systems*
- *demonstrating how ignition modules and ignition systems are tested*
- *ensuring the apprentice participates in the test firing of appliances to confirm the operation of all safety components*

Plumbing Systems — 54 hours

- describe commercial plumbing fixtures
- recognize cross connection control devices
- explain potable hot water distribution systems
- size potable water distribution systems
- discuss municipal infrastructures
- discuss medical gas systems
- explain radon gas prevention systems
- discuss compressed air systems
- discuss underground sprinkler systems
- discuss swimming pools
- describe special piping systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing the apprentice experience installing commercial plumbing fixtures*
- *discussing the different kinds of cross connection control devices and where they are to be installed*
- *explaining how a hot water distribution system works and how to design systems correctly*
- *assisting the apprentice in sizing potable water systems*
- *discussing the requirements of specialized piping systems*

Electrical Controls — 21 hours

- testing electrical circuits
- operation of electrical switches
- electrical transformers
- relays in electrical circuits
- AC motors

Mentors can assist the apprentice to prepare for this section of technical training by:

- *continually asking the apprentice questions to ensure understanding of switches, alternating current, electromagnets, transformers, motors, relays and diagrams*
- *supervising hands-on work with meters on larger heating equipment*
- *supervising hands-on work with pump controls*
- *having the apprentice troubleshoot heating equipment and pump controls*

Level Four — 7 weeks — 210 hours

Special Piping Systems — 27 hours

- explain geothermal heat transfer systems
- explain solar heat transfer systems
- discuss rainwater and greywater reuse
- discuss medical gas systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *having the apprentice identify the components of a medical gas system using codes and regulations*
- *describing how a silfos piping system is purged*
- *exposing the apprentice to various specialty piping systems and their components*
- *discussing and if possible assisting the apprentice in the installation of a residential sprinkler system*

Pumps and Private Water Supply — 27 hours

- compare the available water sources
- discuss potable water supply system components
- explain pump theory
- design a rural water supply system

Mentors can assist the apprentice to prepare for this section of technical training by:

- *ensuring the apprentice knows the differences and applications for different wells and sources of water such as sandpoints, aquifers, artesian, deep and shallow wells*
- *having the apprentice identify and install the basic types of pumps required in a residential water system*
- *ensuring the apprentice can identify all components and accessories used for a rural pump installation*
- *assisting the apprentice to size a rural water supply system*
- *having the apprentice size the pressure tank for a domestic pump installation using charts and Boyles Law*
- *describing the various ways to protect rural systems from frost damage and have the apprentice assist in the installation of these materials if possible*
- *providing supervised exposure to the installation and troubleshooting of rural pump systems*

Process Piping — 27 hours

- explain the Saskatchewan Onsite Waste Water guide
- explain piping materials used in water treatment systems
- explain piping materials used in food processing systems
- discuss water reclaim systems

Mentors can assist the apprentice to prepare for this section of technical training by:

- *discussing rural sewage systems*
- *giving the apprentice exposure to rural sewage systems*
- *discussing food processing piping requirements*
- *explaining water reclaim systems*
- *exposing the water treatment systems*

Water Conditioning — 27 hours

- constituents of water
- water tests
- water treatment devices
- water treatment equipment sizing
- component installation

Mentors can assist the apprentice to prepare for this section of technical training by:

- *discussing water chemistry terminology*
  citing examples to assist the apprentice to identify useable water sources and discussing amounts of contamination
- *having a basic water test kit, demonstrating its use and discussing the outcomes*
- *describe the sizing of and have the apprentice participate in the installation of a water softening system and an iron filtering system*
- *supervising the apprentice during the installation of components for water treatment devices*

Graphics **27 hours**

- construct isometrics views from orthographic projections
- produce plumbing system design
- produce materials list

Mentors can assist the apprentice to prepare for this section of technical training by:

- *ensuring the apprentice can interpret construction documents for system installations with regard to blueprints, specifications and room schedules (room finishes and ceiling heights)*
- *having the apprentice draw isometric drawings to show all waste and vent pipes according to code, including sizing*
- *having the apprentice continually do material take-offs for various types of system installations*

Gasfitting **27 hours**

- flue gas analysis
- electrical controls systems for domestic gas fired appliances
- liquefied petroleum containers
- domestic applications pertaining to the B149.3 Gas Code

Mentors can assist the apprentice to prepare for this section of technical training by:

- *continuing to further the apprentice's ability to interpret the gas codes for both natural and propane gases*
- *monitoring the apprentice in test firing and service procedures on domestic equipment*
- *having the apprentice commission, start and troubleshoot domestic category I to IV appliances and equipment*
- *explaining the purpose and the use of the B149.3 Gas Code as it relates to domestic applications*

Electrical Controls **21 hours**

- troubleshoot electrical controls for a standing pilot appliance
- troubleshoot electrical controls for a direct spark or hot surface ignited appliance
- ladder and connection diagrams
- electrical pump controls

Mentors can assist the apprentice to prepare for this section of technical training by:

- *continuing to expose the apprentice to progressively more difficult installations*
- *insisting the apprentice read all installation manuals from start to finish*
- *assisting the apprentice to interpret detailed wiring diagrams*
- *ensuring the apprentice has an understanding of cable selection, furnace controls and components and submersible pumps*

Introduction to Low Pressure Steam **27 hours**

- use terms and definitions
- discuss steam boilers
- discuss system components

- discuss piping arrangements

Mentors can assist the apprentice to prepare for this section of technical training by:

- *ensure the apprentice is exposed to low pressure steam systems*
- *explain design and troubleshooting of low pressure steam systems*

Consider apprenticeship training as an investment in the future of your company and in the future of your workforce. Ultimately, skilled and certified workers increase your bottom line.

Get involved in the apprenticeship training system. Your commitment to training helps to maintain the integrity of the trade.

Do you have employees who have been working in the trade for a number of years but don't have trade certification?

Contact your local apprenticeship office for details on how they might obtain the certification they need.

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