



Steamfitter-Pipefitter On-the-Job Training Guide

2024

1-877-363-0536
apprenticeship@gov.sk.ca
saskapprenticeship.ca



Saskatchewan
Apprenticeship and
Trade Certification
Commission

Online: www.saskapprenticeship.ca

Recognition:

To promote transparency and consistency, this document has been adapted from the 2016 Steamfitter-Pipefitter 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 document contains the following sections:

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 Steamfitter-Pipefitter Trade: a chart which outlines the topics of technical training with on-the-job examples for apprentices to achieve relevant experience at work.

TRAINING REQUIREMENTS FOR THE STEAMFITTER-PIPEFITTER TRADE

To graduate from each level of the apprenticeship program, an apprentice must successfully complete the required technical training and compile enough on-the-job experience to total at least 1800 hours each year. Total trade time required is 7200 hours and at least 4 years in the trade.

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

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 journeyman'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 layout, forming, framing, exterior and interior finishing
- further the apprentice's ability to interpret technical drawings
- allow the apprentice to apply procedures used for estimating materials, costing projects and supervising personnel
- ensure that the apprentice can evaluate the end product
- where possible, expose the apprentice to new technology in the Carpenter trade

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.

STEAMFITTER-PIPEFITTER TASK MATRIX CHART

This chart outlines the major work activities, tasks and sub-tasks from the 2015 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 training.

A – Performs common occupational skills

12%

A-1 Performs safety-related functions	1.01 Maintains safe work environment 1	1.02 Selects, inspects and uses personal protective equipment (PPE) and safety equipment 1	1.03 Follows lock-out procedures 1		
A-2 Uses and maintains tools and equipment	2.01 Uses common tools and equipment 1	2.02 Uses access equipment 1	2.03 Uses welding equipment 1, 2	2.04 Uses soldering and brazing equipment 1	2.05 Uses oxy-fuel equipment 1, 2
A-3 Organizes job	3.01 Plans work In Context in 1, 2,3,4	3.02 Generates drawings In Context in 1, 2,3,4	3.03 Interprets drawings and specifications In Context in 1, 2,3,4	3.04 Develops piping templates In Context in 1, 2,3,4	3.05 Performs preliminary quality control functions In Context in 1, 2,3,4

B – Performs layout, fabrication and piping installation

23%

B-4 Performs fabrication	4.01 Fabricates piping system components 1, 2 In Context in 3	4.02 Fabricates brackets, supports, hangers, guides and anchors 1, 2 In Context in 3
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B-5 Lays out, identifies and installs piping, tubing, fittings and related components	5.01 Lays out, identifies and installs copper piping, tubing, fittings and related components 1, In Context in 3	5.02 Lays out, identifies and installs plastic piping, tubing, fittings and related components 1, In Context in 3	5.03 Lays out, identifies and installs carbon steel piping, tubing, fittings and related components 1, In Context in 3	5.04 Lays out, identifies and installs stainless steel piping, tubing, fittings and related components 1, In Context in 3	5.05 Lays out, identifies and installs fiberglass piping, fittings and related components 2, In Context in 3
	5.06 Lays out, identifies and installs specialty piping, fittings and related components 2, In Context in 3				
B-6 Installs, maintains, troubleshoots, repairs and tests valves	6.01 Installs valves 1, In Context in 2, 3	6.02 Maintains, troubleshoots, repairs and tests valves 1, In Context in 2, 3			
				7.01 Installs steam tracing systems 3	7.02 Maintains, troubleshoots, repairs and tests steam tracing systems 3
B-7 Installs, tests, maintains, troubleshoots and repairs heat tracing systems			7.04 Maintains, troubleshoots, repairs and tests liquid-filled tracing systems 2		

C – Performs rigging, hoisting, lifting and positioning

13%

C-8 Performs common rigging, hoisting, lifting and positioning	8.01 Determines load 1, In Context in 2, 3	8.02 Prepares lift plans(s) 1, In Context in 2, 3	8.03 Selects rigging, hoisting, lifting and positioning equipment 1, In Context in 2, 3	8.04 Inspects rigging, hoisting, lifting and positioning equipment 1, In Context in 2, 3	8.05 Secures lift area 1, In Context in 2, 3

8.06 Sets up rigging, hoisting, lifting and positioning equipment 1, In Context in 2, 3	8.07 Performs lift and positioning 1, In Context in 2, 3	8.08 Maintains and stores rigging, hoisting, lifting and positioning equipment 1, In Context in 2, 3
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C-9 Performs complex and critical rigging, hoisting, lifting and positioning	9.01 Prepares lift plan for complex and critical rigging, hoisting, lifting and positioning 4	9.02 Performs calculations for complex and critical rigging, hoisting, lifting and positioning 4	9.03 Selects rigging, hoisting, lifting and positioning equipment for complex and critical lifts 4	9.04 Sets up rigging, hoisting, lifting and positioning equipment for complex and critical lifts 4	9.05 Performs complex and critical lifts and positioning 4
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D – Installs, tests, maintains, troubleshoots and repairs low and high pressure steam and condensate systems

18%

D-10 Installs, tests, maintains, troubleshoots and repairs low pressure steam and condensate systems	10.01 Installs equipment for low pressure steam and condensate systems 3	10.02 Installs piping for low pressure steam and condensate systems 3	10.03 Tests low pressure steam and condensate systems 3	10.04 Maintains, troubleshoots and repairs low pressure steam and condensate systems 3
D-11 Installs, tests, maintains, troubleshoots and repairs high pressure steam and condensate systems	11.01 Installs equipment for high pressure steam and condensate systems 4	11.02 Installs piping for high pressure steam and condensate systems 4	11.03 Tests high pressure steam and condensate systems 4	D-11.04 Maintains, troubleshoots and repairs high pressure steam and condensate systems 4

E – Installs, tests, maintains, troubleshoots and repairs heating, cooling and process piping systems

20%

E-12 Installs, tests, maintains, troubleshoots and repairs hydronic systems	12.01 Installs equipment for hydronic systems 2, 3	12.02 Installs piping for hydronic systems 2, 3	12.03 Tests hydronic systems 2, 3	12.04 Maintains, troubleshoots and repairs hydronic systems 2, 3
E-13 Installs, tests, maintains, troubleshoots and repairs process piping systems	13.01 Installs equipment for process piping systems 4	13.02 Installs piping for process piping systems 4	13.03 Tests process piping systems 4	13.04 Maintains, troubleshoots and repairs process piping systems 4
E-14 Installs, tests, maintains, troubleshoots and repairs industrial water and waste treatment systems	14.01 Installs equipment for industrial water and waste treatment systems 3	14.02 Installs piping for industrial water and waste treatment systems 3	14.03 Tests industrial water and waste treatment systems 3	14.04 Maintains, troubleshoots and repairs industrial water and waste treatment systems 3
E-15 Installs, tests, maintains, troubleshoots and repairs hydraulic systems	15.01 Installs equipment for hydraulic systems 4	15.02 Installs piping, tubing and hoses for hydraulic systems 4	15.03 Tests hydraulic systems 4	15.04 Maintains, troubleshoots and repairs hydraulic systems 4
E-16 Installs, tests, maintains, troubleshoots and repairs heating, ventilation, air conditioning and refrigeration (HVACR) systems	16.01 Installs equipment for HVACR systems 4	16.02 Installs hydronic piping and refrigeration tubing for HVACR systems 4	16.03 Tests associated components of HVACR systems 4	16.04 Maintains, troubleshoots and repairs associated components of HVACR systems 4
E-17 Installs, tests, maintains, troubleshoots and repairs fuel systems	17.01 Installs equipment for fuel systems 3	17.02 Installs piping and tubing for fuel systems 3	17.03 Tests fuel systems 3	17.04 Maintains, troubleshoots and repairs fuel systems 3

E-18 Installs, tests, maintains, troubleshoots and repairs medical gas systems	18.01 Installs equipment for medical gas systems 3	18.02 Installs piping and tubing for medical gas systems 3	18.03 Tests medical gas systems 3	18.04 Maintains, troubleshoots and repairs medical gas systems 3
E-19 Installs, tests, maintains, troubleshoots and repairs compressed air and pneumatic systems	19.01 Installs equipment for compressed air and pneumatic systems 4	19.02 Installs piping and tubing for compressed air and pneumatic systems 4	19.03 Tests compressed air and pneumatic systems 4	19.04 Maintains, troubleshoots and repairs compressed air and pneumatic systems 4
E-20 Installs and tests fire protection Systems (NOT COMMON CORE)	20.01 Installs equipment for fire protection systems. (NOT COMMONCORE)	20.02 Installs piping for fire protection systems (NOT COMMONCORE)	20.03 Tests fire protection systems (NOT COMMONCORE)	

F – Installs, tests, maintains, troubleshoots and repairs renewable energy systems

6%

F-21 Installs, tests, maintains, troubleshoots and repairs geo-exchange and geothermal systems	21.01 Installs equipment for geo-exchange and geothermal systems 4	21.02 Installs piping for geo-exchange and geothermal systems 4	21.03 Tests geo-exchange and geothermal systems 4	21.04 Maintains, troubleshoots and repairs geo-exchange and geothermal systems 4
F-22 Installs, tests, maintains, troubleshoots and repairs solar heating systems	22.01 Installs equipment for solar heating systems 4	22.02 Installs piping for solar heating systems 4	22.03 Tests solar heating systems 4	22.04 Maintains, troubleshoots and repairs solar heating systems 4
F-23 Installs, tests, maintains, troubleshoots and repairs heat recovery systems	23.01 Installs equipment for heat recovery systems 4	23.02 Installs piping for heat recovery systems 4	23.03 Tests heat recovery systems 4	23.04 Maintains, troubleshoots and repairs heat recovery systems 4

G – Performs commissioning, start-up and turnover

8%

G-24 Prepares system for commissioning, start-up and turnover	24.01 Flushes system 4	24.02 Chemically treats system 4	24.03 Pre-checks system for commissioning 4	24.04 Selects and connects commissioning equipment 4	
G-25 Commissions systems	25.01 Secures commissioning area 4	25.02 Pressurizes system 4	25.03 Inspects system 4	25.04 Corrects faulty conditions 4	25.05 Participates in start-up and turnover procedures 4

TRAINING PROFILE CHART

This Training Profile Chart represents Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training at the topic level.

Level One	Transcript Code	Hours
Trade Related Safety	SAFE 130 - Theory	15
	SAFE 131 - Shop	15
Tool Basics and Equipment	TOOL 147 – Theory	15
	TOOL 148 - Shop	15
Welding	WLDR 136	30
Pipe Fabrication	PIPE 146 - Theory	30
	PIPE 147 - Shop	30
Rigging, Hoisting and Lifting	RIGG 132	30
Pipe Graphics and Layout	PRNT 172	30
Gasfitting (Exceed)	PIPE 150	30
		240

Level Two	Transcript Code	Hours
Pipe Fabrication	PIPE 281	27
Introduction to Steam Systems	STEA 294	27
Hydronic Systems	HDRO 260 – Theory	47
	HDRO 261 – Shop	7
Welding	WLDR 250	27
Blueprint Reading	PRNT 285	27
Gasfitting (Exceed)	PIPE 280 - Theory	42
	PIPE 283 - Shop	12
Basic Electrical (Exceed)	ELEC 287	24
		240

Level Three	Transcript Code	Hours
Electrical Systems (Exceed)	ELEC 386	14
Gasfitting (Exceed)	PIPE 382	28
Pipe Fabrication	PIPE 381	28
Specialty Piping	PIPE 383	28
Low Pressure Steam Systems	STEA 394	56
Blueprint Reading	PRNT 382	28
Hydronic Heating	HDRO 362	28
		210

Level Four	Transcript Code	Hours
Electrical Systems (Exceed)	ELEC 484	14
Critical Rigging	RIGG 401	28
Pipe Fabrication	PIPE 482	28
HVAC and Refrigeration Systems	RFRG 488	28
Renewable Energy	PIPE 483	15
Process Piping	STE A 482	28
Blueprint Reading	PRNT 482	28
High Pressure Steam Systems	STE A 400	41
		210

ON-THE-JOB AND IN-SCHOOL TRAINING

CONTENT FOR THE STEAMFITTER-PIPEFITTER

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 Related Safety – Theory <ul style="list-style-type: none"> • discuss safe work practices • discuss WHMIS • discuss lockout and tag out procedures 		15 hours
Trade Related Safety – Shop <ul style="list-style-type: none"> • demonstrate safe work practices • apply WHMIS • perform lockout and tag out procedures 		15 hours
Mentors can assist the apprentice to prepare for this section of technical training by: <ul style="list-style-type: none"> • <i>attending shop safety meetings</i> • <i>insisting on appropriate work clothes and personal protective equipment</i> • <i>demonstrating safe work habits regarding confined spaces, ladders and scaffolds</i> • <i>having the apprentice participate in lifting procedures, explaining how and when clevises, slings and other rigging equipment is used</i> • <i>demonstrating, then supervising the apprentice during actual lifts of materials and equipment for crane hand signalling procedures</i> • <i>demonstrating how knots are tied and when each should be used</i> • <i>having the apprentice attend training for WHMIS</i> 		
Tool Basics and Equipment – Theory <ul style="list-style-type: none"> • discuss the use and care of hand tools • discuss the use and care of power tools • discuss access equipment • explain soldering and brazing equipment 		15 hours
Tool Basics and Equipment – Shop <ul style="list-style-type: none"> • demonstrate the use and care of hand tools • demonstrate the use and care of power tools • demonstrate use of access equipment • perform soldering and brazing 		15 hours
Mentors can assist the apprentice to prepare for this section of technical training by: <ul style="list-style-type: none"> • <i>spending time explaining what each tool is used for and demonstrating the proper use</i> • <i>making the apprentice perform a shop inventory to learn the proper names of materials and tools</i> • <i>demonstrating use of various soldering and brazing equipment</i> 		

Welding

30 hours

- describe the safe assembly, operations, shut down and equipment for oxy-fuel cutting (OFC)
- describe the safe assembly, operations, shut down and equipment for Gas Metal Arc Welding (GMAW)
- demonstrate the safe set up, operation and maintenance when performing OFC
- demonstrate the safe set up operation and maintenance when performing GMAW in multiple positions
- demonstrate the safe operation and maintenance when performing GMAW while bridge tacking pipe

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

- *discussing safe welding practices*
- *ensuring the apprentice has appropriate PPE for welding*
- *identifying safety hazards when using an oxy-acetylene torch and GMAW equipment*
- *allowing the apprentice to set-up and operate an oxy-acetylene cutting torch and GMAW machine*

Pipe Graphics and Layout

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 prints 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*

Pipe Fabrication – Theory

30 hours

- discuss piping system layout
- discuss piping system measurements
- explain piping system offsets
- identify pipe system support systems
- discuss common piping materials
- discuss fittings and valves
- define piping system commissioning

Pipe Fabrication – Shop

30 hours

- assemble copper tube and tubing
- assemble plastic tube and tubing
- assemble steel pipe project
- fabricate brackets, supports, guides and anchors
- 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*
-

Rigging, Hoisting and Lifting

30 hours

- explain hoisting, lifting and rigging equipment
- explain hoisting, lifting and rigging procedures
- discuss load weight calculations
- demonstrate hoisting, lifting and rigging techniques
- perform hoisting signals and knot-tying
- explain inspection and maintenance procedures

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

- *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*
-

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

Pipe Fabrication

27 hours

- identify materials used in fabrication
- describe the fabrication process
- examine support and hanger systems
- explain pipe bending theory
- construct piping projects

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

- *demonstrating the safe use of fabrication tools and equipment*
 - *allowing the apprentice to develop a material take-off*
 - *ensuring the apprentice can locate material identification numbers*
 - *demonstrating various jointing methods, including welding for pipe and fittings*
 - *allowing the apprentice to layout ordinate lines on pipe*
 - *exposing the apprentice to heat tracing systems*
 - *ensuring the apprentice understands heat numbers and MFD sheets*
 - *introducing the apprentice to quality control definitions*
 - *exposing the apprentice to piping and systems using HDP*
 - *exposing the apprentice to piping and systems using FRP*
-

Hydronic Systems – Theory

47 hours

- explain the chemical and physical properties of water
- perform mathematical calculations
- describe boilers
- describe boiler components
- 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:

- *exposing the apprentice to various boiler types and explaining the operation of their controls*
- *supervising the apprentice when piping the make-up water for a boiler*
- *supervising the apprentice when troubleshooting a boiler system*
- *discussing the sizing of hydronic systems through heat loss calculations, and the consultation of engineered drawings, jurisdictional codes and specifications*
- *discussing pipe and fitting schedules such as Schedule 80, Schedule 120 and Schedule 160 and their application*
- *giving exposure to a variety of different system installations including series loop, one-pipe and two-pipe layouts*
- *discussing pumps and their components*

Blueprint Reading

27 hours

- draw isometric objects
- explain blueprints and specifications
- discuss spool sheets
- produce compass orientated isometric drawings
- use blueprints and specifications

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

- *ensuring the apprentice can identify blueprint lines, symbols and abbreviations*
 - *allowing the apprentice to use various types drawings*
 - *having the apprentice interpret job specifications from a blueprint*
 - *allowing the apprentice to calculate measurements and distances from a blueprint*
 - *having the apprentice determine material requirements from isometric drawings*
 - *allowing the apprentice to develop material take-off from isometric drawings*
-

Introduction to Steam Systems

27 hours

- discuss the thermodynamic properties of steam
- identify the American Society of Mechanical Engineers (ASME) code requirements for steam boilers and piping systems
- identify steam equipment
- discuss steam traps
- Assemble steam traps

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

- *discussing the ASME code requirements for low pressure steam systems*
 - *exposing the apprentice to various low pressure steam systems*
 - *identifying low pressure boiler trim and explaining their operation*
 - *allowing the apprentice to help install a steam heating system*
 - *supervising the apprentice installing and troubleshooting steam trap*
-

Welding

27 hours

- describe the safe assembly, operations, shut down and equipment for Shield Metal Arc Welding (SMAW)
- describe the safe assembly, operations, shut down and equipment for Gas Tungsten Arc Welding (GTAW)
- demonstrate the safe set up, operation and maintenance when performing SMAW
- demonstrate the safe set up operation and maintenance when performing GTAW
- demonstrate the safe operation and maintenance when performing SMAW while beveling, preparing a land and bridge tacking pipe

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

- *identifying safety hazards when using SMAW and GTAW welding*
- *allowing the apprentice to set up and operate a Shielded Metal Arc Welder*
- *allowing the apprentice to select the appropriate welding rods for the application*
- *ensuring the apprentice is transporting and storing welding equipment as per MSDS requirements*

Gasfitting – Theory

42 hours

- discuss line sizing techniques for piping systems operating at two psi 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

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 combustion 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 the 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*

Basic Electrical

24 hours

- describe basic electrical concepts
- measure voltage, current, resistance, and capacitance using electrical test equipment
- interpret wiring diagrams and 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

Low Pressure Steam Systems

56 hours

- describe low pressure steam (LPS) boilers
- discuss LPS piping systems
- choose steam traps
- use the American Society of Mechanical Engineers (ASME) code
- use steam tables

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

- *discussing the ASME code for low pressure steam systems*
 - *exposing the apprentice to various steam systems*
 - *allowing the apprentice to work on components such as heat exchangers and converters*
 - *supervising the apprentice when installing/servicing condensate returns for low pressure steam systems*
 - *discussing the application of various feed water controls*
 - *allowing the apprentice to select a steam trap for a low pressure steam system*
 - *supervising the apprentice in the installation of low pressure steam boilers and their systems*
 - *exposing the apprentice to testing and maintenance procedures in high pressure steam systems*
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Hydronic Heating

28 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:

- *explaining the components of a circulator and the circulator operates*
 - *explaining the components and safety devices of a hydronic boiler*
 - *assisting the apprentice in the installation of a hydronic heating system*
 - *discussing the operation of control systems*
-

Pipe Fabrication

28 hours

- describe quality control procedures
- discuss templates for fitting fabrication
- discuss piping offsets
- discuss serpentine piping
- discuss steam tracing
- fabricate piping stool project

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

- *allowing the apprentice to develop a cut list from a spool*
- *giving the apprentice shop documentation for quality control*
- *allowing the apprentice to layout a mitred elbow*
- *allowing the apprentice to assemble fabricated piping and fittings*
- *supervising the apprentice when installing piping and systems using HDP*
- *supervising the apprentice when installing piping and systems using FRP*

Specialty Piping

28 hours

- discuss specialty piping systems
- identify specialty piping components and equipment
- describe installation procedures
- discuss codes pertaining to specialty piping systems (SATCC LO codes)
- describe testing procedures

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

- *exposing the apprentice to fiberglass, glass and alloy systems*
- *exposing the apprentice to medical gas and compressed air systems*
- *exposing the apprentice to fuel and oil systems*
- *discussing the various code and material requirements for specialty systems*
- *exposing the apprentice to testing and maintenance of specialty systems*

Gasfitting – Theory

28 hours

- apply line sizing techniques for piping systems operating at two psi 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 gas appliances and equipment
- interpret code requirements for flue gas removal from gas appliances
- examine category one vent system requirements

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 apprentices 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 1 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*

Electrical Systems

14 hours

- test the operation of electrical circuits
- describe the operation of electrical switches
- use electrical transformers
- use relays in electrical circuits
- compare the characteristics of different styles of alternating current (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*

Blueprint Reading

28 hours

- describe spool sheet drawings
- discuss specification books
- interpret isometric spool sheet drawings
- produce and isometric spool sheet drawing

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

- *demonstrating the use of labelling*
- *allowing the apprentice to interpret job specifications from various prints*
- *allowing the apprentice to develop drawings such as spool sheets, material take-off and isometric*
- *allowing the apprentice to develop material take-off from isometric drawings*
- *ensuring the apprentice can develop isometric drawings*

Level Four

7 weeks

210 hours

Process Piping

28 hours

- process piping equipment
- industrial water and waste water systems
- installation procedures for process piping
- process control functions
- testing procedures

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

- *exposing the apprentice to various process boilers*
 - *exposing the apprentice to the various process facilities such as breweries, refineries and pulp mills*
 - *allowing the apprentice to install/service specialty piping systems such as hydraulic, compressed air and medical gas*
 - *discussing the various heat tracing applications*
 - *exposing the apprentice to water and waste water systems*
-

Pipe Fabrication

28 hours

- quality control procedures
- field measurements
- construct isometric spool drawing from field measurement
- a rolling off set project

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

- *allowing the apprentice to construct manufactured fittings using templates, ordinate line and jigs*
 - *having the apprentice complete job planning tasks such as reading blueprints, estimate materials and knowledge of job specific permits*
 - *having the apprentice complete quality control procedures*
 - *allowing the apprentice to fabricate piping spool*
 - *allowing the apprentice to fabricate piping with multi-piece mitered elbows, eccentric branches, and true wyes*
 - *having the apprentice develop as-built drawings*
 - *allowing the apprentice to install piping and systems using HDP*
 - *allowing the apprentice to install piping and systems using FRP*
-

HVAC and Refrigeration Systems

28 hours

- discuss system operation
- discuss the installation of heating, ventilation and air conditioning (HVAC) equipment
- discuss the installation of refrigeration equipment
- describe commissioning procedures
- discuss maintenance and repair procedures

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

- *discussing safety issues with HVAC and refrigeration systems*
 - *exposing the apprentice to HVAC and refrigeration equipment*
 - *allowing the apprentice to pipe in HVAC systems*
-

Blueprint Reading

28 hours

- isometric and orthographic drawings
- industrial equipment and materials
- gridlines and coordinates

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

- *ensuring the apprentice can determine locations, elevations and measurements from blueprints*
 - *allowing the apprentice to interpret flow diagrams such as utilities, mechanical, process and P&ID*
 - *having the apprentice determine material requirements from spool sheets*
 - *ensuring the apprentice can interpret job specifications from various drawings*
-

High Pressure Steam Systems

41 hours

- examine high pressure steam properties
- differentiate power boilers, process boilers, and high temperature hot water boilers
- examine boiler trim for high pressure steam boiler
- relate ASME code to high pressure steam boilers and trim
- discuss the operation of high-pressure steam systems
- analyze the piping procedures for high pressure steam systems
- discuss testing procedures for high pressure steam systems
- explain maintenance, troubleshooting, and repair of high-pressure steam systems
- implement water treatment strategies

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

- *discussing the ASME code for high pressure steam systems*
 - *exposing the apprentice to various steam systems*
 - *allowing the apprentice to work on components such as heat exchangers and converters*
 - *supervising the apprentice when installing/servicing condensate returns for low pressure steam systems*
 - *discussing the application of various feed water controls*
 - *allowing the apprentice to select a steam trap for a low pressure steam system*
 - *supervising the apprentice in the installation of low pressure steam boilers and their systems*
 - *exposing the apprentice to testing and maintenance procedures in high pressure steam systems*
-

Electrical Systems

14 hours

- troubleshoot flame safeguard controls
- interpret ladder diagrams and connection diagrams
- troubleshoot natural gas fired furnaces
- explain the electrical controls used with submersible pumps

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, boiler controls and components and pumps*
-

Renewable Energy

15 hours

- describe equipment
- discuss piping configurations
- describe testing procedures

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

- *discussing geo-thermal system components such as exchangers, controls and circulating pumps*
 - *allowing the apprentice to use various joining methods such as HDPE and FRP*
 - *exposing the apprentice to different types of systems, such as surface, direct bore and binary*
 - *allowing the apprentice to identify, test, and maintain geo- exchange, geothermal, and solar systems*
-

Critical Rigging

28 hours

- describe lift plan requirements
- explain load charts and weight calculations
- classify rigging equipment used in industry
- examine equipment usage
- compare details of different lift plans

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

- *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*

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.

Saskatchewan Apprenticeship & Trade Certification Commission

2140 Hamilton St Regina SK S4P 2E3

Tel: (306) 787-2444

Fax: (306) 787-5105

Toll Free: 1-877-363-0536

Website: www.saskapprenticeship.ca

District Offices

Estevan (306) 637-4930

La Ronge (306) 425-4385

Moose Jaw (306) 694-3735

North Battleford (306) 446-7409

Prince Albert (306) 953-2632

Saskatoon (306) 933-8476

Swift Current (306) 778-8945

Yorkton (306) 786-1394