Apprenticeship Manitoba

Manitoba

Steamfitter-Pipefitter
Level 1

Rev. April 2019

Apprenticeship Manitoba

Steamfitter-Pipefitter

UNIT A1 SAFETY AND ORIENTATION

Subunit: A1a Trade Safety Awareness

Level: One

Duration: 6 hours

Theory: 6 hours

Practical: 0 hours

Overview:

Safe working procedures and conditions, injury prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to incidents or injury. It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe, and accident-free working environment. It is imperative to apply and be familiar with the Workplace Safety and Health Act and Regulations. As well, it's essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment. Safety education is an integral part of Steamfitter-Pipefitter apprenticeship training both in school and on-the-job. Unit content is supplemented throughout technical training by trade-specific information about Steamfitter-Pipefitter safety hazards and precautions presented in the appropriate contexts of discussion and study. ***Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. A "Pass/Fail" grade will be recorded for the unit. A Pass mark is assumed to be 70%. Therefore 70% is the mark to be submitted to the Apprenticeship Branch clerks for inputting into computer records.***

Objectives and Content:	**Percent of Unit Mark (%)**
1. Identify safety and health requirements.	n/a
a. Overview of The Workplace Safety and Health Act • Rights and responsibilities of employees under the Act • Rights and responsibilities of employers under the Act • Rights and responsibilities of supervisors under the Act b. Fourteen (14) regulations c. Codes of practice d. Guidelines e. Right to refuse • Explanation of right to refuse process • Rights and responsibilities of employees • Rights and responsibilities of employers • Rights and responsibilities of supervisors under the Act	
2. Identify personal protective equipment (PPE) and procedures.	n/a
a. Employer and employee responsibilities as related to personal protective equipment	

b. Standards: ANSI (U.S.A. standards), etc
c. Work protective clothing and danger if it fits poorly
d. Gloves – Importance of proper glove selection (when handling chemicals, cold items, slivers, etc.)
e. Headwear – appropriate protective headwear when required and the approved type of headwear
f. Eye protection – comparison and distinction of everyday eyeglasses, industrial safety glasses and safety goggles
g. Foot protection – when required according to safety standards
h. Hearing protection
   - Hazards of various noise levels (hearing protection must be worn)
   - Laws
   - Types of hearing protection
i. Respiratory protection – types, overview of proper selection
j. Fall protection – Manitoba requirements standards guidelines
   - ANSI (U.S.A. standards), etc.
k. Ladders and scaffolding
l. Safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.)

3. Identify workplace regulations applicable to the: n/a

a. Care and cleanliness in the working area
b. Safe use of chemicals
c. Use of scaffolding, and
d. Use of ladders and related equipment

4. Identify ergonomics. n/a

a. Definition of ergonomics and conditions that may affect the body
   - Working postures
   - Repetition
   - Force
   - Lifting
   - Tools
   - Identify tool and safety equipment
   - Causes of hand tool accidents
   - Equipment

5. Hazard recognition and control. n/a

a. HPA and HPR. Hazardous Products Act and Hazardous Products Regulations
b. Safe work practices
c. Basic risk assessment
d. Injury prevention and control measures
e. Identification of hazards involved in pneumatic tool use and explanation of how to guard against them
f. Refrigerants
g. Toxic chemical (non-refrigerant)
h. High pressure fluids

6. Hazard of confined space entry. n/a

a. Identification of a confined space
b. Hazards of a confined space (including physical and biological hazards)
c. Working in a confined space
d. Emergency response plan

e. Self-contained breathing apparatus (SCBA)

7. Identify first aid/CPR. n/a

a. Overview of first aid regulation
b. Obligations of employers regarding first aid
   - Who is certified to provide first aid?
   - What to do while waiting for help?
   - Where is the first aid kit located?
c. Describe basic first aid requirements and techniques
   - Scope and limits of first aid intervention
   - Specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
   - Interface with other services and agencies (e.g., Workers Compensation claims)
d. Describe basic CPR requirements and techniques
   - How do you get certified?
   - Scope and limits of CPR intervention (include varieties of CPR certification)

8. Identify the safety requirements as they apply to WHMIS 2015 with emphasis on: n/a

a. WHMIS 1988 vs 2015 as system. What is same and what has changed? What is GHS?
b. Provincial regulation under the Safety and Health Act
   - Each province has a WHMIS regulation
c. Federal Hazardous Products Act
d. WHMIS generic training:
   - WHMIS defined and the format used to convey information about hazardous materials in the workplace
   - Information found on supplier and workplace labeling using WHMIS
   - Hazardous materials in accordance with WHMIS
   - Compliance with government safety standards and regulations
e. Description of WHMIS (include varieties of WHMIS Certification)
   - Typology of WHMIS labels, symbols, and classifications
   - Scope and use of Materials/Safety Data Sheets (M/SDS)

9. Identifying and controlling hazards. n/a

a. Basic control measures (injury prevention)
b. Safe work procedures
c. Explanation on the importance of industrial housekeeping
d. Employer responsibilities
e. How and where to store materials
f. Safety measures related to walkways, stairs and floor openings
g. Explanation of how to protect the worker and others when working in traffic paths

10. Describe the safe storage of stock equipment in service vehicles and transportation of dangerous goods. n/a

11. Describe Asbestos Safety and Health Requirements. n/a

a. Describe what asbestos is, and why it has been used so much
b. Describe the potential health hazards associated with asbestos
c. Identify typical products and materials that contain asbestos
d. Describe proper precautions and work practices when working around asbestos
e. Describe how to recognize asbestos hazards due to damage or deterioration

f. Describe appropriate response to an asbestos fiber release

g. Describe what Workplace Safety and Health regulations, guidelines and bulletins apply to workers who work with or work around asbestos and what aspects of those regulations, guidelines and bulletins affect you or your company

12. Review the amendments to The Workplace Safety and Health Regulation to meet harmonization recommendations of the Occupational Safety and Health of the Canadian Association of Administrators of Labour Legislation, a cross-jurisdictional advisory and consultative body respecting shared issues relating to occupational safety and health which include: n/a

a. Updating first-aid kits and first-aid certifications in accordance with newly developed Canadian Standards Association standards as part of a national system for workplace first aid;

b. Extending baseline hearing test requirements from within 70 days of hire to up to six months and replace annual hearing reports with requirements to report every two years;

c. Clarifying existing requirements for the provision and use of several types of personal protective equipment including high-visibility safety apparel, hearing protection, life jackets and personal flotation devices; and

d. Ensuring a secondary air supply is carried on the person or within arm's reach for workers working in dangerous atmospheres.

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Steamfitter-Pipefitter

Subunit: A1b Learning About Work

Level: One

Duration: 5 hours

Theory: 5 hours

Practical: 0 hours

Overview:

One sign that an apprentice has become competent in a task or technique is to be asked to share this knowledge. Jobsite skills-exchange has long been fundamental to trade-learning. Even trade veterans rely on peers to refine their knowledge and skill. The opportunity to benefit from this process, however, is shaped by complex factors that include jobsite 'politics' and industrial/construction deadlines. As adult trade-learners, apprentices at all levels of training must use their observational, listening and interpersonal skills to benefit from the JP's knowledge and experience. This requires understanding the trade's dynamics, as well as the roles and responsibilities which order workplace/jobsite work-life.

This unit profiles the trade's structure and scope as determined by the Apprenticeship and Certification Act, regulations, Provincial Advisory Committees and the National/Provincial Occupational Analysis from which the training standards are derived (core tasks and skill requirements), as well as its job-ladders and long-term career options and social competencies. This includes information about major areas of working knowledge, activities and interactions at work, and expansive and restrictive workplaces, stressing their application to apprenticeship on-the-job training.

A sound grasp of the roles, workplace relationships, and possibilities introduced in this unit are part of 'learning to learn' in Manitoba's apprenticeship system. Senior apprentices are later offered information about learning to *teach* in this system – a central and time-honored foundation of Trades journeywork.

Objectives and Content: **Percent of Unit Mark (%)**

1. Describe structure and scope of the Steamfitter-Pipefitter trade. **50%**

a. The Apprenticeship and Certification Act
- Apprenticeship and Certification Board and Provincial Advisory Committees
- General and specific trade regulation
- Policies regarding attendance, evaluation procedures, conduct and progression requirements (Apprenticeship Manitoba, Training provider)

b. Uses of the Red Seal Occupational Standards (RSOS).
- Technical training in-school curriculum
- On-the-job record book of hours (Manitoba blue book)
- Logbook of on-the-job task competencies.
- Examinations (level placement tests, final certification examinations)

c. Opportunities and future career options
- Generalists and specialists. The move toward specialization is well known to modern tradespeople. Some prefer to specialize and others want to do it all. Supervisory positions require a broad scope.

- Lead hands and other immediate supervisors. Apprentices need to know how to become a lead-hand as much as they need to know the benefits and pit-falls of leadership between management and shop floor workers.
- Geographic mobility. What does it mean to a construction/industrial worker to have to travel to find work? Are there more opportunities if they do? What are they? What are the draw-backs to being away from home for several weeks at a time?
- Job hierarchies and innovations. What trade specific special training opportunities are available in your trade? Is there travel involved? Is there an opportunity to move up the ladder on a work crew as opposed to staying in the shop?

2. Describe two levels of workplace competency. **30%**

a. Job competencies related to workplace culture
   - Knowledge of workplace equipment and materials
   - Skills and techniques

b. Social competencies related to workplace culture
   - Frame of reference for evaluation workplace events
   - Language of work
   - Workplace belief systems
   - Rules and meanings
   - Multiculturalism and equity in the workplace

3. Describe accommodation for apprentices with disabilities. **20%**

a. Technical training
   - Requirements
   - Roles and responsibilities
   - Services and information required by persons with disabilities

b. On-the-job
   - Requirements
   - Roles and responsibilities
   - Services and information required by persons with disabilities

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Apprenticeship Manitoba

Steamfitter-Pipefitter

Subunit: A1c Communications and Trade Communication

Level: One

Duration: 14 hours

Theory: 14 hours

Practical: 0 hours

Overview:

Steamfitters-Pipefitters require a good, practical grasp of communication and trade documentation.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe the importance of effective verbal and non-verbal communication. a. Other tradespersons b. Colleagues c. Supervisors d. Suppliers/manufacturers e. Clients/customers f. Inspectors g. Sub-trades	**25%**
2. Identify types of communication equipment and describe their applications and procedures for use.	**25%**
3. Identify types of trade related documentation and describe their applications and procedures for use. a. Manufacturers' specifications b. Codes and standards c. Work orders d. Maintenance schedules e. Permits f. Quality control (e.g. material identification and handling, heat number transfer and weld mapping)	**25%**
4. Explain the process, requirements and information sources for completing trade related documentation and reports.	**25%**

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Apprenticeship Manitoba

Steamfitter-Pipefitter

UNIT A2 TOOLS AND EQUIPMENT I

SubUnit: A2a Tools and Equipment I

Level: One
Duration: 10 hours
Theory: 10 hours
Practical: 0 hours

Overview:

This unit introduces Steamfitter-Pipefitter apprentices to basic procedures for selecting, using, and maintaining tools and equipment in a variety of gasfitting-project settings. The principles and practical methods introduced here are pursued in greater depth and complexity throughout technical training.

Objectives and Content:		**Percent of Unit Mark (%)**
1.	**Describe use, selection, and maintenance of safety gear and personal protective equipment by Steamfitters-Pipefitters.**	**5%**
2.	**Describe the selection, use, and maintenance of additional soldering tools and equipment.**	**5%**
3.	**Describe techniques for the selection, use, and maintenance of soldering tools and equipment.**	**5%**
4.	**Describe basic techniques for use, selection, and maintenance of safety gear and personal protective equipment by Steamfitters-Pipefitters.**	**5%**
5.	**Describe basic techniques for hand-tool use, selection, and maintenance by Steamfitters-Pipefitters.**	**20%**
6.	**Describe the selection, use, and maintenance of power tools/equipment.**	**10%**
7.	**Describe basic techniques for the selection, use, and maintenance of power tools/equipment.**	**10%**
8.	**Describe the selection, use, and maintenance of technical instruments, and testers, and other tools and equipment as specified by the instructor.**	**10%**
9.	**Describe basic techniques for the selection, use, and maintenance of technical instruments, testers, and other tools and equipment as specified by the instructor.**	**30%**

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Steamfitter-Pipefitter

Subunit: A2b Access Equipment

Level: One

Duration: 5 hours

Theory: 5 hours

Practical: 0 hours

Overview:

Steamfitter-Pipefitters require a good, practical grasp of access equipment. This unit of instruction is the program gateway to further learning about access equipment knowledge and skills related to ladders, scaffolding and hydraulic lifts, their applications, limitations and procedures for use.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with ladders, scaffolding and hydraulic lifts.	**11%**
2. Identify hazards and describe safe work practices pertaining to ladders, scaffolding and hydraulic lifts.	**11%**
3. Identify codes and regulations pertaining to ladders, scaffolding and hydraulic lifts. a. Training and certification requirements	**11%**
4. Identify types of ladders, scaffolding and hydraulic lifts and describe their characteristics and applications.	**11%**
5. Describe the procedures used to erect and dismantle ladders and scaffolding.	**10%**
6. Describe the procedures used to inspect, maintain and store ladders, scaffolding and hydraulic lifts.	**10%**
7. Describe procedures for use of ladders, scaffolding and hydraulic lifts, their applications, and limitations.	**36%**

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UNIT A3 RIGGING, HOISTING AND LIFTING

Subunit: A3a Rigging, Hoisting and Lifting

Level: One

Duration: 12 hours

Theory: 12 hours

Practical: 0 hours

Overview:

After completing this unit, Steamfitter-Pipefitter apprentices will describe hoisting, lifting and rigging equipment, their applications, limitations and procedures for use. The Unit will also describe the procedures used to perform hoisting and lifting operations. Finally, the Unit will describe calculations required when performing hoisting and lifting operations.

Objectives and Content:		**Percent of Unit Mark (%)**
1.	**Define terminology associated with hoisting, lifting and rigging.**	**5%**
2.	**Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging.**	**5%**
3.	**Identify codes and regulations pertaining to hoisting, lifting and rigging.**	**5%**
4.	**Identify types of rigging equipment and accessories and describe their limitations, applications and procedures for use.**	**5%**
5.	**Identify types of hoisting and lifting equipment and accessories and describe their applications and procedures for use.**	**5%**
6.	**Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment.**	**5%**
7.	**Identify types of knots, hitches and bends and describe their applications and the procedures used to tie them.**	**5%**
8.	**Describe the procedures used to rig material/equipment for lifting.**	**5%**
9.	**Describe the procedures used to ensure the work area is safe for lifting.** a. Supervision of lift b. Securing work area c. Communication	**5%**

10. Identify and describe procedures used to communicate during hoisting, lifting and rigging operations. **5%**

a. Hand signals
b. Electronic communications
c. Audible/visual

11. Explain sling angle when preparing for hoisting and lifting operations. **5%**

12. Identify the factors to consider when selecting rigging equipment **5%**

a. Load characteristics
b. Environment
c. Safety factor

13. Describe the procedures used for attaching rigging equipment to the load. **5%**

14. Describe the procedures used to perform a lift. **5%**

a. Load determination
b. Communication methods
c. Pre-lift checks
d. Placement of load
e. Post-lift inspection

15. Describe the procedures used to perform hoisting and lifting operations. **13%**

16. Perform calculations required when performing hoisting and lifting operations. **17%**

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Apprenticeship Manitoba

Steamfitter-Pipefitter

UNIT A4 LAYOUT I

Subunit: A4a Pipe, Tube and Tubing Fundamentals Theory

Level: One
Duration: 10 hours
Theory: 10 hours
Practical: 0 hours

Overview:

Upon completion of this unit of instruction apprentices will be able to show additional understanding of basic pipe, tube and tubing and fundamentals related to Steamfitter-Pipefitter situations.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Explain forces that impact on pipe, tube and tubing systems and perform associated calculations. a. Thermal expansion b. Thermal contraction c. Weight d. Friction loss e. Turbulence f. Galvanic action g. Environmental	**33%**
2. Describe calculations to determine pipe, tube and tubing measurements. a. Run and branch b. Fitting allowances c. Offsets including travel, rise and run, rolling, equal spread, unequal spread	**33%**
3. Describe pipe, tube and tubing applications.	**34%**

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Steamfitter-Pipefitter

Subunit: A4b Copper Tube and Tubing Theory

Level: One

Duration: 10 hours

Theory: 10 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to provide the Steamfitter-Pipefitter apprentice with additional basic knowledge and understanding of copper tube and tubing.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Explain the systems of measurement for copper tube and tubing. a. Dimension b. Length c. Wall thickness/schedule	**10%**
2. Describe the procedures used to measure copper tube and tubing.	**10%**
3. Perform calculations to determine copper tube and tubing measurements. a. Run and branch b. Fitting allowances c. Offsets	**10%**
4. Describe the procedures used to inspect copper tube and tubing.	**10%**
5. Identify the methods used to cut copper tube and tubing and describe their associated procedures.	**10%**
6. Describe the procedures used to bend copper tube and tubing.	**10%**
7. Identify the methods used to join copper tube and tubing and describe their associated procedures. a. Brazing b. Soldering c. Flaring d. Roll groove e. Compression fittings f. Mechanical joints	**10%**
8. Describe the procedures used to install fittings and accessories for copper tube and tubing.	**10%**

9. Describe the procedures used to measure, cut and join copper tube and tubing. 20%

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Steamfitter-Pipefitter

Subunit: A4c Plastic Piping Theory

Level: One

Duration: 5 hours

Theory: 5 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to provide the Steamfitter-Pipefitter apprentice with additional basic knowledge and understanding of plastic piping.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Explain the systems of measurement for plastic piping. a. Dimension b. Length c. Wall thickness/schedule	**10%**
2. Describe the procedures used to measure plastic piping.	**10%**
3. Perform calculations to determine plastic piping measurements. a. Run and branch b. Fitting allowances c. Offsets	**10%**
4. Describe the procedures used to inspect plastic piping.	**5%**
5. Identify the methods used to cut plastic piping and describe their associated procedures.	**5%**
6. Identify the methods used to join plastic piping and describe their associated procedures. a. Heat fusion welding b. Threading c. Solvent welding d. Compression fittings e. Mechanical joints	**5%**
7. Describe the procedures used to install fittings and accessories for plastic piping.	**5%**
8. Describe the procedures used to measure, cut and join plastic piping.	**50%**

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Apprenticeship Manitoba

Steamfitter-Pipefitter

Subunit: A4d Black Iron Piping Theory

Level: One

Duration: 20 hours

Theory:	20	hours
Practical:	0	hours

Overview:

This unit of instruction is designed to provide the Steamfitter-Pipefitter apprentice with additional basic knowledge and understanding of black iron piping.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe the procedures used to measure black iron piping.	**20%**
2. Describe the procedures used to inspect black iron piping.	**20%**
3. Identify the methods used to cut black iron piping and describe their associated procedures.	**20%**
4. Identify the methods used to join black iron piping and describe their associated procedures. a. Threaded b. Grooved c. Welded d. Flanged e. Press-fit f. Compression fittings	**20%**
5. Describe the procedures used to install fittings and accessories for black iron piping.	**20%**

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Apprenticeship Manitoba

Steamfitter-Pipefitter

UNIT A5 FABRICATION I

Subunit: A5a Pipe, Tube and Tubing and Fundamentals II

Level: One
Duration: 11 hours
Theory: 11 hours
Practical: 0 hours

Overview:

Upon completion of this unit of instruction apprentices will be able to show understanding of basic pipe, tube and tubing and fundamentals related to Steamfitter-Pipefitter situations.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with pipe, tube and tubing.	**33%**
2. Identify types of pipe, tube and tubing systems. a. Water supply b. Sanitary drainage, waste and vent c. Storm drainage d. Heating e. Sprinkler f. Gas g. Process and power generating h. Refrigeration i. Compressed air	**33%**
3. Identify types of pipe, tube and tubing and describe their applications. a. Steel b. Plastic c. Copper d. Brass e. Aluminum f. Cast iron: ductile, duriron and grey. g. Historic h. Glass i. Asbestos-cement j. Reinforced concrete k. Stainless steel l. Fiberglass	**34%**

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Steamfitter-Pipefitter

Subunit: A5b Copper Tube and Tubing Practical

Level: One
Duration: 18 hours
Theory: 0 hours
Practical: 18 hours

Overview:

This unit of instruction is designed to provide the Steamfitter-Pipefitter apprentice with the basic knowledge and practical understanding of copper tube and tubing.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Demonstrate the procedure used to measure, cut and join copper tube and tubing.	**50%**
2. Demonstrate copper tube and tubing installation projects.	**50%**

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Steamfitter-Pipefitter

Subunit: A5c Plastic Piping Practical

Level: One

Duration: 7 hours

Theory: 0 hours

Practical: 7 hours

Overview:

This unit of instruction is designed to provide the Steamfitter-Pipefitter apprentice with the basic knowledge and practical understanding of plastic piping.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Demonstrate the procedure used to measure, cut and join plastic piping.	**50%**
2. Demonstrate plastic piping installation projects.	**50%**

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Steamfitter-Pipefitter

Subunit: A5d Black Iron Piping Practical

Level: One

Duration: 35 hours

Theory: 0 hours

Practical: 35 hours

Overview:

This unit of instruction is designed to provide the Steamfitter-Pipefitter apprentice with the basic knowledge and practical understanding of black iron piping.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Demonstrate the procedure used to measure, cut and join black iron piping.	**50%**
2. Demonstrate black iron piping installation projects.	**50%**

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Steamfitter-Pipefitter

Subunit: A5e Introduction to Welding, Arc Welding and Cutting

Level: One

Duration: 25 hours

Theory: 5 hours

Practical: 20 hours

Overview:

Steamfitter-Pipefitter's require a good, practical grasp of welding, fuel brazing and cutting. This unit is the program gateway to further your welding, arc welding and cutting skills.

Objectives and Content:	Percent of Unit Mark (%)
1. Define terminology associated with arc welding.	**4%**
2. Identify hazards and describe safe work practices pertaining to arc welding. a. Personal b. Workplace	**4%**
3. Interpret codes and regulations pertaining to arc welding. a. Certification requirements	**4%**
4. Interpret information pertaining to arc welding found on drawings and specifications. a. Symbols and abbreviations	**4%**
5. Describe the properties and characteristics of metals.	**4%**
6. Identify types of arc welding equipment and describe their associated components, accessories and consumables.	**4%**
7. Identify basic weld joints and describe their applications.	**4%**
8. Describe the procedures used to set up, adjust, maintain and store arc welding equipment, their components, accessories and consumables.	**4%**
9. Describe the procedures used to tack weld.	**4%**
10. Demonstrate the procedures used to set up, adjust, maintain and store arc welding equipment, their components, accessories and consumables.	**32%**
11. Demonstrate the ability to perform oxyacetylene and arc welding.	**32%**

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UNIT A6 VALVES

Subunit: **A6a Piping Valves**

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to provide the Steamfitter-Pipefitter with the knowledge and understanding of piping valves. After completing this unit, apprentices will be able to learn, amongst other skills, the following objectives.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with piping valves.	**7%**
2. Identify hazards and describe safe work practices pertaining to piping valves.	**7%**
3. Interpret codes, regulations and standards pertaining to piping valves.	**7%**
4. Interpret information found on drawings and specifications pertaining to piping valves.	**7%**
5. Identify tools and equipment relating to piping valves and describe their applications and procedures for use.	**7%**
6. **Identify types of piping valves and describe their characteristics, operation and applications.** a. Gate b. Globe c. Ball d. Plug e. Butterfly f. Check g. Relief h. Pop safety i. Pressure reducing j. Float operated k. Diaphragm l. Mixing	**7%**

m. Automated valves
n. Needle valves
o. Pressure sustaining valves

7. **Identify types of valve actuators and describe their purpose.** **7%**
   a. Electric
   b. Pneumatic
   c. Manual

8. **Explain piping valve rating systems.** **7%**
   a. Pressure
   b. Temperature

9. **Identify the methods used to join piping valves and describe their associated procedures.** **7%**

10 **Describe the procedures used to install piping valves.** **7%**

11 **Describe the procedures used to maintain and repair piping valves.** **5%**

12 **Describe the procedures used to test and troubleshoot piping valves.** **5%**

13 **Describe the procedures used to install, maintain, repair, test and troubleshoot piping valves.** **20%**

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UNIT A7 MATHEMATICS I

Subunit: A7a Mathematics I

Level: One

Duration: 20 hours

Theory: 20 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to provide the Steamfitter-Pipefitter apprentice with the knowledge of the imperial and metric systems, formulas and formula transposition, and areas and volumes.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Identify and describe metric (S.I.) and imperial weights and measures, decimals and fractions, terms prefixes and relationships.	**9%**
2. Identify and describe formulas and formula transposition.	**9%**
3. Identify and describe the square root, perimeter and circumference.	**9%**
4. Identify and describe areas of rectangles, circles, triangles, trapezoids and surface areas.	**9%**
5. Identify and describe volumes of rectangular, cylindrical and irregular objects.	**9%**
6. Identify and describe Pythagora's theorem.	**9%**
7. Identify and describe special right angle triangles: a. 45° b. 30° - 60° c. 22-1/2°	**9%**
8. Identify and describe grade: a. Simple b. Percentage c. cm/m/in./ft.	**9%**
9. Identify and describe density, relative density and pressure in liquids and gases (kpa) as well as Charle's and Boyle's gas laws.	**9%**
10. Identify and describe parallel offsets.	**9%**
11. Identify and describe simple percentage, mark-up, net profit, gross profit.	**10%**

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Steamfitter-Pipefitter

UNIT A8 SCIENCE I

Subunit: A8a Science I

Level: One

Duration: 20 hours

Theory: 20 Hours

Practical: 0 Hours

Overview:

This unit of instruction is designed to provide the Steamfitter-Pipefitter apprentice with the knowledge of such science topics as metals and alloys.

Objectives and Content: **Percent of Unit Mark (%)**

1. Describe with respect to sciences metals and alloys: **50%**

a. Define metals, alloys, conduction, melting point, specific heat, linear expansion, ductility, shear strength, tensile strength, compressive strength, working (safe) strength, malleable, ferrous, non-ferrous ,anneal, harden, temper.
b. Identify the most common metals
c. Identify the most common alloys
d. Define cost effectiveness
e. Identify and describe properties of metals
f. Identify and describe problems in linear expansion
g. Identify and describe bi-metal strip and its uses
h. Identify and describe various solder
i. Identify and describe wrought iron
j. Identify and describe corrosion (oxidation): chemical and electrochemical
k. Identify and describe methods in preventing corrosion
l. Identify and describe galvanic series
m. Identify and describe factors aiding corrosion
n. Identify and describe corrosion resistant materials

2. Describe with respect to sciences hydrodynamics, hydrostatics and pneumatics: **50%**

a. Define hydrodynamics, hydrostatics, pneumatics, fluids, viscosity, adhesion, cohesion, capillary action, relative density, pressure (psi, psia, pascals, head).
b. Total pressure, transmission of pressure, vacuum, partial vacuum, siphon, manometer, buoyancy, laminar flow, turbulent flow, pitot tube, velocity head, venturi, bernoulli's theorem, hydraulic ram, water hammer, cavitation.
c. Identify and describe plumbing systems
d. Identify and describe flow of liquids and gases
e. Identify and describe pressurized systems
f. Identify and describe hydraulic jacks and presses
g. Identify and describe thrust blocks
h. Identify and describe air chambers

i. Identify and describe pumps
j. Identify and describe syphons
k. Identify and describe velocity head
l. Identify and describe bourdon type pressure gauge
m. Identify and describe uses of buoyance
n. Identify and describe conversion of fps to gpm and gpm to fps, m/s to i/s and i/s to m/s
o. Identify and describe flow in venturis
p. Identify and describe Bernoulli's theorem applied
q. Identify and describe Charle's. and Boyle's gas laws

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Apprenticeship Manitoba

Steamfitter-Pipefitter

Unit A9 ELECTRICAL I

Subunit: A9a Electrical I

Level: One
Duration: 25 hours
Theory: 25 hours
Practical: 0 hours

Overview:

Steamfitter-Pipefitters require a good, practical grasp of electricity. This unit of instruction is the program gateway to further learning about this topic. Electrical theory is presented in a manner that is relevant and useful. The apprentice will learn a basic overview of the fundamentals of electricity.

Objectives and Content:		**Percent of Unit Mark (%)**
1.	**Define terminology associated with electricity as related to the trade.**	**20%**
2.	**Identify hazards and describe safe work practices pertaining to electricity.**	**20%**
3.	**Interpret electrical related information found on drawings and specifications.**	**20%**
4.	**Identify tools and equipment used to test electrical circuits and describe their applications and procedures for use.**	**20%**
5.	**Explain Ohm's law and describe its applications and associated calculations.**	**20%**

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Apprenticeship Manitoba

Steamfitter-Pipefitter

Subunit: A10a Drawings

Level: One

Duration: 15 hours

Theory: 15 hours

Practical: 00 hours

Overview:

Steamfitter-Pipefitters require a good, practical grasp of project design basics, as well as the ability to use technical drawings for a variety of trade tasks. Technical drawing is medium for exploring built structures in detail, as well as a tool for developing new ideas and solving problems. This unit of instruction is the program gateway to further practical learning about construction-project design variations, technical drawing, and blueprint-reading skills. The unit also offers Steamfitter-Pipefitter apprentices a chance to apply some of the techniques, procedures, and conventions used in professional drafting and design. Elsewhere in technical training, apprentices will refine their skills in the use of trade documents through hands-on work with a variety of construction-project blueprints.

This unit of instruction is also designed to reinforce and further enhance the techniques of sketching and drawing to reinforce the procedures of blueprint reading, relying on the principles, symbols and convention, and to give the student a technical interpretation or orthographic drawings and develop a relationship between simple object forms and a set of normal building trade drawings.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Demonstrate the procedures used for the care, handling and storage of drawings.	**5%**
2. Demonstrate basic sketching techniques.	**5%**
3. Demonstrate basic Steamfitter-Pipefitter and gas layout drawings.	**5%**
4. Construct with the use of drafting instruments an accurate isometric or orthographic drawing of a piping system using the correct line and piping symbols.	**5%**
5. Construct using acceptable techniques an isometric or orthographic sketch of a piping system using the correct line and piping symbols. The finished sketch to be of approximately the correct shape and proportions. a. Isometric sketching and drawing b. Orthographic sketching and drawing c. Line symbols d. Piping symbols	**5%**
6. Describe how to relate a typical set(s) of building trade drawings to the orthographic drawing system and by doing so obtain required information from the various plans elevations, sections and details in the four major divisions within a	**5%**

set of building trade drawings (i.e., architectural, structural, mechanical and electrical).

7. Describe how to extract correctly basic information from a typical set of specification (i.e. fixture types, hangers and supports, types of pipe and fittings for various services, etc.): Theory of sections, development of relationship from simple orthographic drawings to build trade drawings, and blueprint reading of suitable, available building, trade drawings and specification. **5%**

8. Given a set of architectural drawings produce a working set of steamfitter-pipefitter drawings as related to the mechanical section of building trade drawings, describe how to: **15%**

a. Interpret and extract architectural and structural information from blueprints by having the steamfitter-pipefitter system conform to the conditions of the building (beams, ceiling spaces, etc.) (T)
b. Use the correct line and piping symbols for showing rain water leaders, storm sewer, sanitary sewer, vents, cold water, hot water and recirculated hot water lines (P)
c. Interpret site plan information by connecting building services to street mains, including the calculation of satisfactory invert elevations of storm and sanitary drains at the building line (T)
d. Indicate specification references by identifying each different plumbing fixture by a "P-number" system. (T)
e. Use her/his code tables with reference to an actual building condition in calculating storm sewer (roof area) sizes and sanitary sewer and vent (fixture unit count) sizes. (T)
f. Construct accurate isometric drawings of washroom groups from orthographic piping layouts (floor plans). (P)
g. Production of a working set of building drawings in the students' trade area. (P**)**

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Apprenticeship Manitoba

Steamfitter-Pipefitter

Subunit: A10b Blueprints

Level: One

Duration: 15 hours

Theory: 15 hours

Practical: 0 hours

Overview:

Steamfitter-Pipefitters require a good, theoretical grasp of project design basics, as well as the ability to use technical drawings for a variety of trade tasks. Technical drawing is medium for exploring built structures in detail, as well as a tool for developing new ideas and solving problems. This unit of instruction is the program gateway to further learning about construction-project design variations, technical drawing, and blueprint-reading skills. Elsewhere in technical training, apprentices will refine their skills in the use of trade documents through hands-on work with a variety of construction-project blueprints.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with drawings and sketches.	**5%**
2. Describe metric and imperial systems of measurement and the procedures used to perform conversions.	**5%**
3. Identify the types of drawings and describe their applications. a. Civil/site b. Architectural c. Mechanical d. Structural e. Electrical f. Shop drawings g. Sketches	**5%**
4. Identify types of symbols and describe their characteristics and applications.	**5%**
5. Identify drawing projections and views and describe their applications. a. Change orders b. Addendums c. As-builts d. Specifications	**5%**
6. Identify drawing projections and views and describe their applications. a. Projections (orthographic, oblique, isometric) b. Views (plan, section, detail, elevation, cross section)	**5%**
7. Describe the use of scales.	**5%**

8. Describe the procedures used for the care, handling and storage of drawings. 5%

9. Describe Steamfitter-Pipefitter and gas layout drawings. 5%

10. Interpret information on drawings. 5%

a. Lines
b. Legend
c. Symbols and abbreviations
d. Noted and specifications
e. Schedules
f. Scales

Apprenticeship Manitoba

Steamfitter-Pipefitter

UNIT A11 GAS CODE I

Subunit: A11a Gas Code I

Level: One
Duration: 20 hours
Theory: 20 hours
Practical: 0 hours

Overview:

This unit of instruction is designed to provide the Steamfitter-Pipefitter apprentice with the basic knowledge and understanding of gas code.

Objectives and Content:		**Percent of Unit Mark (%)**
1.	**Define terminology associated with gas code.**	**10%**
2.	**Identify hazards and describe safe work practices pertaining to gas code.**	**10%**
3.	**Interpret codes and regulations pertaining to gas.**	**10%**
4.	**Interpret information pertaining to gas found on drawings and specifications.**	**10%**
5.	**Describe the identification systems and methods for gas.**	**10%**
6.	**Identify tools and equipment relating to gas and describe their applications and procedures for use.**	**10%**
7.	**Identify gas systems and describe their characteristics and applications.**	**10%**
8.	**Identify types of gas and describe their properties and characteristics.**	**10%**
9.	**Explain the systems of measurement for gas.**	**10%**
10.	**Describe the procedures used to install fittings and accessories for steel piping.**	**10%**

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