

# Steamfitter-Pipefitter Level 2

## Steamfitter-Pipefitter

**Unit:** B1 Industrial Drawings

**Level:** Two

**Duration:** 30 hours

Theory: 30 hours

Practical: 0 hours

### Overview:

This unit is designed to provide the Steamfitter-Pipefitter apprentice with the knowledge and understanding of industrial drawings.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with industrial drawings and specifications.</b>	20%
<b>2. Identify types of industrial drawings and describe their applications.</b> a. process and instrumentation drawings (P&ID) b. spool sheets c. isometric (ISO) drawings d. revisions e. vendor	20%
<b>3. Identify symbols relating to industrial drawings and describe their characteristics and applications.</b>	20%
<b>4. Identify industrial drawing-related documentation and describe their applications.</b>	20%
<b>5. Interpret and extract information from industrial drawings and specifications.</b>	20%

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## Steamfitter-Pipefitter

**Unit:** B2 Template Development

**Level:** Two

**Duration:** 20 hours

Theory: 20 hours

Practical: 0 hours

### Overview:

This unit is designed to provide the Steamfitter-Pipefitter apprentice with the knowledge and understanding of template development.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with template development.	20%
2. Interpret information pertaining to template development found on drawings and specifications.	20%
3. Identify tools and equipment relating to template development and describe their applications and procedures for use.	20%
4. Identify the methods used for template development. a. simple b. parallel line c. radial line d. triangulation	20%
5. Describe the procedures used to develop templates.	20%

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## Steamfitter-Pipefitter

**Unit:** B3 Spool and Fitting Fabrication

**Level:** Two

**Duration:** 22 hours

Theory: 8 hours

Practical: 14 hours

### Overview:

This unit is designed to provide the Steamfitter-Pipefitter apprentice with the knowledge and understanding of spool and fitting fabrication.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with spool fabrication.	4%
2. Interpret information pertaining to spool fabrication found on drawings and specifications.	4%
3. Identify tools and equipment relating to spool fabrication and describe their applications and procedures for use.	4%
4. Describe the procedures used to fabricate and assemble pipe spools.	4%
5. Demonstrate the procedures used to fabricate pipe spools.	32%
6. Define terminology associated with fitting fabrication.	4%
7. Interpret codes and regulations pertaining to fitting fabrication.	4%
8. Interpret information pertaining to fitting fabrication found on drawings and specifications.	3%
9. Identify tools and equipment relating to fitting fabrication and describe their applications and procedures for use.	3%
10. Identify types of fittings and describe their characteristics and applications.	3%
a. elbow	
b. tees	
c. true wyes	
d. laterals	
e. crosses	
11. Describe the procedures used to layout and fabricate fittings.	3%

**12. Demonstrate knowledge of the procedures to fabricate pipe fittings.**

32%

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## Steamfitter-Pipefitter

**Unit:** B4 Advanced Hoisting, Lifting, and Rigging

**Level:** Two

**Duration:** 14 hours

Theory: 14 hours

Practical: 00 hours

### Overview:

This unit is designed to provide the Steamfitter-Pipefitter apprentice with the knowledge and understanding of advanced hoisting, lifting, and rigging.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Identify hazards and describe safe work practices pertaining to advanced hoisting, lifting and rigging operations.</b>	25%
a. energized power lines	
b. critical lifts	
c. weather conditions	
d. ground conditions	
e. multi-tag lines	
<b>2. Identify documentation required for engineered lifts.</b>	25%
<b>3. Describe how to do calculations pertaining to hoisting, lifting and rigging.</b>	25%
a. sling angle	
b. load/weight	
c. centre of gravity	
d. safe working loads (SWL)	
<b>4. Describe how to do advanced lifts.</b>	25%
a. ball and hook	
b. multi-lift	
c. transferring	
d. unbalanced	
e. positioning	

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## Steamfitter-Pipefitter

**Unit:** B5 Stainless Steel Piping

**Level:** Two

**Duration:** 18 hours

Theory: 8 hours

Practical: 10 hours

### Overview:

This unit is designed to provide the Steamfitter-Pipefitter apprentice with the knowledge and understanding of stainless steel piping.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with stainless steel piping.	3%
2. Identify hazards and describe safe work practices pertaining to stainless steel piping.	3%
3. Interpret codes and regulations pertaining to stainless steel piping.	3%
4. Interpret information pertaining to stainless steel piping found on drawings and specifications.	3%
5. Describe identification systems and methods used for stainless steel piping.	3%
6. Identify tools and equipment related to stainless steel piping and describe their applications and procedures for use.	3%
7. Identify fittings used with stainless steel piping and describe their purpose and applications.	3%
8. Identify stainless steel piping accessories and describe their purpose and applications. <ul style="list-style-type: none"> <li>a. supports</li> <li>b. hangers</li> <li>c. sleeves</li> </ul>	3%
10. Explain the systems of measurement for stainless steel piping. <ul style="list-style-type: none"> <li>a. dimension</li> <li>b. length</li> <li>c. wall thickness/schedule</li> </ul>	3%
11. Describe the procedures used to measure stainless steel piping.	3%

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|---|------------|
| <b>12. Describe the procedures used to inspect stainless steel piping.</b>                                    | <b>3%</b>  |
| <b>13. Identify the methods used to cut stainless steel piping and describe their associated procedures.</b>  | <b>3%</b>  |
| <b>14. Identify the methods used to join stainless steel piping and describe their associated procedures.</b> | <b>3%</b>  |
| a. threaded   |            |
| b. grooved  |            |
| a. welded   |            |
| b. flanged  |            |
| c. press-fit  |            |
| d. compression fittings   |            |
| <b>15. Describe the procedures used to install fittings and accessories for stainless steel piping.</b>       | <b>3%</b>  |
| <b>16. Describe the different types, schedules, uses of stainless steel pipe.</b>                             | <b>5%</b>  |
| <b>17. Demonstrate the procedures used to measure, cut and join stainless steel piping.</b>                   | <b>50%</b> |

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## Steamfitter-Pipefitter

**Unit:** B6 Fiberglass Piping

**Level:** Two

**Duration:** 3 hours

Theory: 3 hours

Practical: 0 hours

### Overview:

This unit is designed to provide the Steamfitter-pipefitter apprentice with the knowledge and understanding of fiberglass piping

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with fiberglass piping.	7%
2. Identify hazards and describe safe work practices pertaining to fiberglass piping.	7%
3. Interpret codes and regulations pertaining to fiberglass piping.	7%
a. manufacturers' certification requirements	
4. Interpret information pertaining to fiberglass piping found on drawings and specifications.	7%
5. Describe the identification systems and methods for fiberglass piping.	7%
6. Identify tools and equipment relating to fiberglass piping and describe their applications and procedures for use.	7%
7. Identify fittings used with fiberglass piping and describe their purpose and applications.	7%
8. Identify fiberglass piping accessories and describe their purpose and applications.	7%
a. supports	
b. hangers	
c. sleeves	
9. Explain the systems of measurement for fiberglass piping.	7%
a. dimension	
b. length	
c. wall thickness/schedule	
10. Describe the procedures used to measure fiberglass piping.	7%

11. Describe the procedures used to inspect fiberglass piping. 7%
12. Identify the methods used to cut fiberglass piping and describe their associated procedures. 6%
13. Identify the methods used to join fiberglass piping and describe their associated procedures. 6%
14. Describe the different types, schedules, uses of stainless fiberglass pipe. 5%
15. Describe the procedures used to install fittings and accessories for fiberglass piping. 6%

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## Steamfitter-Pipefitter

**Unit:** B7 Specialty Piping

**Level:** Two

**Duration:** 21 hours

Theory: 21 hours

Practical: 0 hours

### Overview:

Steamfitters-Pipefitters require a good, practical grasp of specialty piping. This unit is the program gateway to further learning about these topics.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with specialty piping.	6%
2. Identify hazards and describe safe work practices pertaining to specialty piping.	6%
3. Interpret codes and regulations pertaining to specialty piping.	6%
4. Interpret information pertaining to specialty piping found on drawings and specifications.	6%
5. Describe the identification systems and methods for specialty piping.	6%
6. Identify tools and equipment relating to specialty piping and describe their applications and procedures for use.	6%
7. Identify specialty piping systems and describe their characteristics and applications.	6%
8. Identify types of specialty piping and describe their properties and characteristics.	7%
a. duplex	
b. super duplex	
a. copper nickel	
b. chrome molybdenum	
c. monel	
d. inconel	
e. titanium	
f. aluminum	
g. other	

- |   |           |
|---|-----------|
| <b>9. Identify fittings used with specialty piping and describe their purpose and applications.</b>     | <b>7%</b> |
| <b>10. Identify specialty piping accessories and describe their purpose and applications.</b>           | <b>7%</b> |
| a. supports   |           |
| b. hangers  |           |
| c. sleeves  |           |
| <b>11. Explain the systems of measurement for specialty piping.</b>                                     | <b>7%</b> |
| a. dimension  |           |
| b. length   |           |
| c. wall thickness/schedule  |           |
| <b>12. Describe the procedures used to measure specialty piping.</b>                                    | <b>6%</b> |
| <b>13. Describe the procedures used to inspect specialty piping.</b>                                    | <b>6%</b> |
| <b>14. Identify the methods used to cut specialty piping and describe their associated procedures.</b>  | <b>6%</b> |
| <b>15. Identify the methods used to join specialty piping and describe their associated procedures.</b> | <b>6%</b> |
| <b>16. Describe the procedures used to install fittings and accessories for specialty piping.</b>       | <b>6%</b> |

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## Steamfitter-Pipefitter

**Unit:** B8 Hydronic Systems

**Level:** Two

**Duration:** 91 hours

Theory: 66 hours

Practical: 25 hours

### Overview:

Steamfitters-Pipefitters require a good, practical grasp of hydronic systems. This unit is the program gateway to further learning about these topics.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with hydronic systems.	3%
2. Identify hazards and describe safe work practices pertaining to hydronic systems.	3%
3. Interpret codes and regulations pertaining to hydronic systems.	3%
4. Interpret information pertaining to hydronic systems found on drawings and specifications.	3%
5. Identify tools and equipment relating to hydronic systems and describe their applications and procedures for use.	3%
6. Explain the principles of heat transfer. <ul style="list-style-type: none"> <li>a. radiation</li> <li>b. conduction</li> <li>c. convection</li> </ul>	3%
7. Identify sources of heat used in hydronic systems. <ul style="list-style-type: none"> <li>a. oil</li> <li>b. gas</li> <li>c. solid fuel</li> <li>d. geothermal</li> <li>e. solar</li> <li>f. electric</li> </ul>	3%

8. **Identify sources of cooling used in hydronic systems.** 3%
- a. ground source
  - b. cooling
  - c. direct expansion
9. **Identify types of hydronic systems and describe their characteristics and operation.** 3%
- a. high pressure (awareness of)
  - b. low pressure
10. **Identify hydronic heating system components and describe their purpose and operation.** 3%
- a. piping
  - b. boilers : low mass and high mass
  - c. boiler trim
  - d. heat pumps
  - e. expansion tanks
  - f. heat exchangers
  - g. circulating pumps
  - h. mixing components
  - i. valves
11. **Explain forces that impact on pipe and tubing in hydronic systems and their associated calculations.** 3%
- a. thermal expansion
  - b. thermal contraction
  - c. weight
  - d. friction loss
  - e. turbulence
  - f. galvanic action
12. **Identify types of heat transfer equipment and describe their characteristics and operation** 3%
- a. radiators
  - b. convectors
  - c. pipe coils
  - d. horizontal and vertical unit heaters
  - e. radiant panels
  - f. Heat exchangers, others, panels
13. **Identify fluids used in hydronic systems and describe their characteristics and applications.** 3%
- a. water

- b. glycol
  - c. methyl hydrate
14. **Identify additives used in hydronic systems and describe their purpose and applications.** 3%
  15. **Identify piping arrangements used with hydronic heating systems and describe their characteristics and applications.** 3%
    - a. reverse return
    - b. direct return
    - c. monoflow
    - d. series loop
    - e. primary/secondary
  16. **Identify hydronic cooling system components and describe their purpose and operation.** 3%
    - a. piping
    - b. cooling towers
    - c. expansion tanks
    - d. chillers
    - e. circulating pumps
    - f. valves
    - g. panels, coils, etc.
  17. **Identify piping arrangements used with hydronic cooling systems and describe their characteristics and applications.** 3%
  18. **Describe the procedures used to layout and install piping for hydronic systems.** 3%
  19. **Describe the procedures used to install hydronic system components.** 3%
  20. **Describe the procedures used to maintain and repair hydronic system components.** 3%
  21. **Describe the procedures used to test and troubleshoot hydronic system components.** 3%
  22. **Describe the procedures used to install heat transfer equipment.** 3%
  23. **Describe the procedures used to protect heat transfer equipment.** 3%
  24. **Describe the procedures used to maintain and repair heat transfer equipment.** 3%

- 25. Describe the procedures used to test and troubleshoot heat transfer equipment. 3%
- 26. Demonstrate the procedures used to install, maintain, repair, test and Troubleshoot hydronic systems. 25%

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## Steamfitter-Pipefitter

**Unit:** B9 Hydronic Systems Control

**Level:** Two

**Duration:** 27 hours

Theory: 21 hours

Practical: 6 hours

### Overview:

Steamfitters-Pipefitters require a good, practical grasp of hydronic systems control. This unit is the program gateway to further learning about these topics.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with hydronic systems control.	6%
2. Identify hazards and describe safe work practices pertaining to hydronic systems control.	6%
3. Interpret codes and regulations pertaining to hydronic systems control.	6%
4. Interpret information pertaining to hydronic systems control found on drawings and specifications.	6%
5. Identify tools and equipment relating to hydronic systems controls and describe their applications and procedures for use.	6%
6. Identify types of hydronic systems controls and describe their characteristics, applications and operation <ul style="list-style-type: none"> <li>a. operating and temperature controls</li> <li>b. safety controls</li> </ul>	6%
7. Identify hydronic systems control components and describe their purpose and operation.	7%
8. Describe the procedures used to install hydronic systems control components.	7%
9. Describe the procedures used to protect hydronic systems control components.	7%
10. Describe the procedures used to set and adjust hydronic systems control components.	7%
11. Describe the procedures used to maintain and repair hydronic systems control	7%

**components.**

- 12. Describe the procedures used to test and troubleshoot hydronic systems control components. 7%**
- 13. Demonstrate the procedures used to install, maintain, repair, test and troubleshoot hydronic systems control. 22%**

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## Steamfitter-Pipefitter

**Unit:** B10 Cross Connection Controls

**Level:** Two

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

### Overview:

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

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with cross connection control.	10%
2. Identify hazards and describe safe work practices pertaining to cross connection control.	10%
3. Interpret codes and regulations pertaining to cross connection control: training and certification requirements.	10%
4. Interpret information pertaining to cross connection control found on drawings and specifications.	10%
5. Identify tools and equipment relating to cross connection control and describe their applications and procedures for use.	10%
6. Explain backflow and its causes.	10%
7. Identify types of cross connection control devices and describe their characteristics, operation and applications.	10%
8. Describe the procedures used to install cross connection control devices.	10%
9. Describe the procedures used to maintain and repair cross connection control devices.	10%
10. Describe the procedures used to test and troubleshoot cross connection control devices.	10%

## Steamfitter-Pipefitter

**Unit:** B11 Mathematics/Science II (includes heat load calculations, fan laws and pumps)

**Level:** Two

**Duration:** 40 hours

Theory: 40 hours

Practical: 0 hours

**Overview:**

Upon completion of this unit of instruction apprentices will be able to show understanding of intermediate mathematics and science fundamentals related to steamfitter-pipefitter situations which includes electricity

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Describe by reviewing level one contents relating to elevations and grades.	6%
2. Describe rolling offsets.	6%
3. Describe jumper offsets.	6%
4. Describe special case of 45° offset.	6%
5. Describe water pressure: head and force.	6%
6. Describe air pressure and air chambers.	6%
7. Describe ratio of pipe capacities.	6%
8. Describe ratio and proportion.	6%
9. Describe by reviewing any problem contents.	6%
10. Describe basic electricity.	15%
a. electron theory	
b. Ohm's Law	
c. basic series circuits	
d. parallel circuit	
e. millivoltage	
f. 24 volt circuit	
g. 110 volt circuit	
h. open and closed circuits (controls)	

- i. relay circuit
- j. voltage drops in circuit

**11. Describe electrical devices.** 15%

- a. thermopile and thermocouple
- b. transformer
- c. gas valves
- d. thermostats
- e. safety controls
- f. connectors and connections
- g. wire sizes and types
- h. Identify and explain meters
- i. Code requirements
- j. motors

**12. Describe gas appliances, sequence of operation.** 16%

- a. basic wiring systems
- b. circuit wiring systems
- c. wiring diagrams of the appliances
- d. troubleshooting controls and circuits
- e. electronic ignition systems

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## Steamfitter-Pipefitter

**Unit:** B12 Arc Welding

**Level:** Two

**Duration:** 22 hours

Theory: 7 hours

Practical: 15 hours

### Overview:

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

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
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.	64%

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