

Steamfitter-Pipefitter Level 3

Steamfitter-Pipefitter

UNIT C1 HEAT TRACING SYSTEMS (INCLUDES STEAM)

Subunit: C1a Low Pressure Steam Systems

Level: Three

Duration: 34 hours

Theory: 23 hours

Practical: 11 hours

Overview:

This unit is designed to provide the Steamfitter-Pipefitter apprentice with the basic knowledge and understanding of low pressure steam systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Explain the properties of steam.	4%
2. Describe the use of steam tables. a. Pressure b. Temperature c. Latent heat d. Sensible heat e. Total heat f. Volume	4%
3. Define terminology associated with low pressure steam systems.	4%
4. Identify hazards and describe safe work practices pertaining to low pressure steam systems.	4%
5. Interpret codes and regulations pertaining to low pressure steam systems. a. American Society of Mechanical Engineers (ASME)	4%
6. Interpret information pertaining to low pressure steam systems found on drawings and specifications.	4%
7. Identify tools and equipment relating to low pressure steam systems and describe their applications and procedures for use.	4%
8. Explain the applications of low pressure steam systems. a. Heating b. Process	4%

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| 9. | Identify types of low pressure steam heating systems and describe their characteristics. | 4% |
| | a. Mechanical return | |
| | b. Gravity return | |
| 10. | Identify types of low pressure steam process systems and describe their characteristics. | 4% |
| | a. Mechanical return | |
| | b. Gravity return | |
| 11. | Describe the procedures used to grade piping in low pressure steam systems. | 4% |
| | a. Boilers: fire tube, water tube | |
| | b. Boiler trim | |
| | c. Piping | |
| | d. Supports | |
| | e. Connections | |
| | f. Expansion joints | |
| | g. Pumps | |
| | h. Heat transfer equipment | |
| | i. Steam traps: mechanical, thermostatic, thermodynamic | |
| | j. Tanks | |
| | k. Valves | |
| | l. Water treatment equipment | |
| 12. | Identify types of low pressure steam system controls and describe their purpose and operation. | 4% |
| | a. Low water cut-offs (LWCO) | |
| | b. Operating pressure controls | |
| | c. High limit pressure controls | |
| | d. Zone valves (motorized) | |
| 13. | Describe the procedures used to install steam tracing, their controls and components. | 4% |
| 14. | Describe the procedures used to install low pressure steam systems, their controls and components. | 4% |
| 15. | Describe the procedures used to maintain and repair low pressure steam systems, their controls and components. | 4% |
| 16. | Describe the procedures used to test and troubleshoot low pressure steam systems, their controls and components. | 4% |
| 17. | Demonstrate the procedures used to install, maintain, repair, test and troubleshoot low pressure steam systems. | 36% |

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Subunit: C1b High Pressure Steam Systems

Level: Three

Duration: 65 hours

Theory: 44 hours

Practical: 21 hours

Overview:

This unit is designed to provide the Steamfitter-Pipefitter apprentice with the basic knowledge and understanding of high pressure steam systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with high pressure steam systems.	10%
2. Identify hazards and describe safe work practices pertaining to high pressure steam systems.	10%
3. Interpret codes and regulations pertaining to high pressure steam systems.	8%
a. American Society of Mechanical Engineers (ASME)	5%
4. Interpret information pertaining to high pressure steam systems found on drawings and specifications.	
5. Identify tools and equipment relating to high pressure steam systems and Describe their applications and procedures for use.	5%
6. Explain the applications of high pressure steam systems.	10%
a. Power generation	
b. Process	
7. Identify high pressure steam system components and describe their purpose and operation.	10%
a. Boilers: fire tube, water tube	
b. Boiler trim	
c. Piping	
d. Tanks	
e. Supports	
f. Connections	
g. Expansion joints	
h. Pumps	
i. Heat transfer equipment	

- j. Steam traps; mechanical, thermostatic, thermodynamic
- k. Valves
- l. Water treatment equipment

8. Identify types of high pressure steam system controls and describe their purpose and operation. 10%

- a. Low water cut-offs (LWCO)
- b. Operating pressure controls
- c. High limit pressure controls
- d. Pressure reducing valves

9. Demonstrate the procedures to install, maintain, repair, test and troubleshoot high pressure steam systems. 32%

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Subunit: C1c Condensate Return Systems

Level: Three

Duration: 37 hours

Theory: 30 hours

Practical: 7 hours

Overview:

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

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with condensate return systems.	10%
2. Identify hazards and describe safe work practices pertaining to condensate return systems.	10%
3. Interpret codes and regulations pertaining to condensate return systems. American Society of Mechanical Engineers (ASME)	10%
4. Interpret information pertaining to condensate return systems found on drawings and specifications.	10%
5. Identify types of condensate return systems and describe their characteristics and applications.	10%
6. Identify condensate return system components and describe their purpose and operation.	10%
a. Piping	
b. Traps	
c. Tanks	
d. Expansion joints	
e. Pumps	
f. Valves	
7. Describe the procedures used to install condensate return systems and components.	10%
8. Describe the procedures used to maintain and repair condensate return systems and components.	5%
9. Describe the procedures used to test and troubleshoot condensate return systems and components.	5%

10. Demonstrate the procedures used to install, maintain, repair, test and troubleshoot condensate return systems.

20%

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UNIT C2 INDUSTRIAL WATER TREATMENT EQUIPMENT

Unit: C2a Process Piping Systems

Level: Three

Duration: 35 hours

Theory: 35 hours

Practical: 0 hours

Overview:

This unit is designed to provide the Steamfitter-Pipefitter apprentice with the basic knowledge and understanding of process piping systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with process piping systems.	10%
2. Identify hazards and describe safe work practices pertaining to process piping systems.	10%
3. Interpret codes and regulations pertaining to process piping systems.	10%
4. Interpret information pertaining to process piping systems found on drawings and specifications.	10%
5. Identify tools and equipment relating to process piping systems and describe their applications and procedures for use.	10%
6. Identify types of process piping systems and describe their characteristics and applications. a. Gas/oil refining b. Pulp production c. Mining d. Food processing e. Chemical production	10%
7. Identify process piping system components and describe their purpose and operation.	10%
8. Describe the procedures used to install process piping systems and their components.	10%
9. Describe the procedures used to maintain and repair process piping systems and their components.	10%

- 10. Describe the procedures used to test and troubleshoot process piping systems and their components. 10%**

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UNIT C3 HYDRONIC SYSTEMS (INCLUDES CONTROLS)

Subunit: C3a Hydronic Controls

Level: Three

Duration: 7 hours

Theory: 7 hours

Practical: 0 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.

Objectives and Content:

**Percent of
Unit Mark (%)**

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|---|------|
| 1. Describe the procedures used to install, maintain, repair, test and troubleshoot hydronic systems control. | 100% |
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UNIT C4 HEAT TRACING SYSTEMS (includes Steam)

Subunit: C4a Low Pressure Steam Heat Tracing

Level: Three

Duration: 26 hours

Theory: 20 hours

Practical: 6 hours

Overview:

Steamfitters-Pipefitters require a good, practical grasp of low pressure steam heat tracing. This unit is the program gateway to further learning about these topics.

Objectives and Content:

**Percent of
Unit Mark (%)**

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| 1. Describe low pressure steam heat tracing. | 77% |
| 2. Demonstrate the procedures used to install, maintain, repair, test and troubleshoot low pressure steam heat tracing. | 23% |

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Subunit: C4b High Pressure Steam Heat Tracing

Level: Three

Duration: 14 hours

Theory: 5 hours

Practical: 9 hours

Overview:

Steamfitters-Pipefitters require a good, practical grasp of high pressure steam heat tracing. This unit is the program gateway to further learning about these topics.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe high pressure steam heat tracing.	35%
2. Demonstrate the procedures used to install, maintain, repair, test and troubleshoot high pressure steam heat tracing.	65%

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UNIT C5 FUEL SYSTEMS

Subunit C5a Fuel Systems

Level: Three

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

This unit is designed to provide the Steamfitter-Pipefitter apprentice with the basic knowledge and understanding of fuel systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe how to select fuel equipment.	4%
2. Describe how to size fuel equipment.	4%
3. Describe location and placement of fuel equipment.	4%
4. Describe how to select and use installation tools and equipment required for installation of equipment.	4%
5. Describe how to install equipment supports, fasteners and components	4%
6. Describe how to determine installation method.	4%
7. Demonstrate knowledge of fuel systems, their components, applications and operation	4%
8. Demonstrate knowledge of fuel system equipment, their applications and operation	4%
9. Demonstrate knowledge of the procedures used to install equipment for fuel systems	4%
10. Describe how to select and size piping and tubing for fuel systems	4%
11. Describe how to determine routing of piping and tubing for fuel systems.	4%
12. Describe how to determine high points and low points for fuel equipment and components.	4%

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|-----|---|----|
| 13. | Describe how to select and use installation tools and equipment. | 4% |
| 14. | Describe how to determine joining method for piping system | 4% |
| 15. | Describe how to clean and prepare fittings and joints | 4% |
| 16. | Describe how to calculate grade or pitch of piping. | 4% |
| 17. | Describe how to install piping supports. | 9% |
| 18. | Describe how to assemble and install piping | 9% |
| 19. | Describe how to assemble and install venting and exhaust piping components. | 9% |
| 20. | Describe how to determine bonding requirements | 5% |
| 21. | Explain fuel piping and tubing, their applications and operation | 4% |

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UNIT C6 MEDICAL GAS

Unit: C6a Medical Gas and Gas Piping Systems

Level: Three

Duration: 15 hours

Theory: 10 hours

Practical: 5 hours

Overview:

This unit is designed to provide the Steamfitter-Pipefitter apprentice with the basic knowledge and understanding of medical gas and gas piping systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with medical gas systems and gas piping systems.	5%
2. Identify hazards and describe safe work practices pertaining to medical gas systems and gas piping systems pertaining to the handling, storage and transportation of gas cylinders.	5%
3. Interpret codes and regulations pertaining to medical gas systems.	5%
a. Diameter Index Safety System (DISS)	
b. Pin indexing system	
4. Interpret information pertaining to medical gas systems found on drawings and specifications.	5%
5. Identify tools and equipment relating to medical gas systems and describe their applications and procedures for use.	5%
6. Identify types of medical gases and describe their characteristics.	5%
a. Oxygen	
b. Nitrogen	
c. Nitrous oxide/anesthetic	
d. Medical air	
e. Vacuum	
f. Physical characteristics	
g. Composition	
h. Toxicity	
i. Specific gravity	
j. Heating value	
k. Flame temperature and speed	
l. Limits of flammability	
m. Ignition temperature	

- n. Combustion process
 - o. Natural gas liquefied
 - p. Natural gas -compressed
 - q. Liquefied petroleum gas
 - r. Petroleum
7. **Identify medical gas system and gas piping systems equipment, components and accessories and describe their applications and operation.** 5%
 - a. Vacuum pumps
 - b. Medical air compressors
 - c. Piping
 - d. Valves
 - e. Alarms
 - f. Sensors
 8. **Identify the considerations for selecting components and accessories for medical gas systems and gas piping systems.** 5%
 9. **Describe the procedures used to install medical gas systems and gas piping systems and pipe sizing.** 5%
 10. **Describe the procedures used to protect medical gas systems and gas piping systems.** 5%
 11. **Describe the procedures used to maintain and repair medical gas systems and gas piping systems.** 17%
 12. **Demonstrate the procedures used to test and troubleshoot medical gas systems and gas piping systems.** 33%

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UNIT: C7 MATHEMATICS III

Subunit: C7a Mathematics III

Level: Three

Duration: 20 hours

Theory: 20 hours

Practical: 0 hours

Overview:

Steamfitters-Pipefitters require a good, practical grasp of mathematics systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe by reviewing level two contents relating to elevations and grades.	10%
2. Describe rolling offsets.	10%
3. Describe jumper offsets.	10%
4. Describe special case of 45° offset.	10%
5. Describe water pressure. a. Head b. Force	10%
6. Describe air pressure and air chambers.	10%
7. Describe ratio of pipe capacities.	10%
8. Describe ratio and proportion.	10%
9. Describe conversion factors.	10%
10. Describe by reviewing any problem math content.	10%

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UNIT C8 ELECTRICAL III

Subunit: C8a Electrical Controls and Diagrams For Pumps and Hydraulics

Level: Three

Duration: 30 hours

Theory: 20 hours

Practical: 10 hours

Overview:

Steamfitters-Pipefitters require a good, practical grasp of intermediate level electrical content. This unit of instruction is the program gateway to further learning about these topics. Electrical theory is presented in a manner that is relevant and useful. The apprentice will learn about the basic fundamentals of electricity and build on what was previously taken in level 1 Steamfitter/Pipefitter technical training.

Objectives and Content:

Percent of Unit Mark (%)

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|---|-----|
| 1. Identify and describe electrical controls. | 5% |
| 2. Identify and describe diagrams for hydronic and pump control systems. | 5% |
| 3. Read and Interpret electrical related information on hydronic and pump control schematics. | 10% |
| 4. Demonstrate the use of proper electrical tools & testing equipment on hydronic & pump control systems. | 20% |
| 5. Identify electrical controls used in hydronic & pump systems. | 20% |
| 6. Identify types of electrical circuits used in hydronic & pump systems. | 10% |
| 7. Explain the operation of electrical controls in hydronic & pump systems. | 10% |
| 8. Troubleshoot controls in hydronic & pump systems. | 20% |

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UNIT **C9 GAS CODE II**

Subunit: **C9a Gas Code II**

Level: Three

Duration: 25 hours

 Theory: 20 hours

 Practical: 5 hours

Overview:

Steamfitters-Pipefitters require a good, practical grasp of intermediate level gas code content.

Objectives and Content:

**Percent of
Unit Mark (%)**

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|--|------------|
| 1. Describe B 149.1 section 8. | 80% |
| a. Air supply | |
| b. Gas venting | |
| 2. Demonstrate air supply and gas venting as applied. | 10% |
| 3. Troubleshoot gas system controls. | 10% |
