

Steamfitter Apprenticeship

Green Modules for Steamfitter Apprenticeship

Module 2: Energy Management Systems

Instructor Guide



Wisconsin Department of Workforce Development

Bureau of Apprenticeship Standards

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Module

2

Steamfitter Apprenticeship

Green Modules for Steamfitter Apprenticeship

Introduction & Background

Green jobs are in demand. But most are not new occupations. They are traditional occupations, upgraded with skills training in new technologies that promote renewable energy and energy efficiency. Therefore, providing “green” training is the focus of the Wisconsin Sector Alliance for the Green Economy (SAGE) project, a federal grant implemented by the Wisconsin Bureau of Apprenticeship Standards.

SAGE includes the Steamfitter trade to prepare future steamfitters to install and maintain green technologies and systems. Industry drives apprenticeship, and enhancing the steamfitter apprenticeship was no exception. After skilled steamfitters and WTCS instructors analyzed and determined the training needs, they developed the curriculum.

INDUSTRY FOCUS GROUP

The Steamfitter Industry Focus Group met April 28, 2011 to identify green trends in the steamfitter trade and recommended additions and/or revisions to the apprenticeship curriculum. The meeting outcomes provided the foundation and blueprint for enhancing the apprenticeship curriculum. Step 1 was to analyze the occupation and its “green” trends. Step 2 was to design and develop the new curriculum. Step 3 will be to rollout the curriculum, train instructors, and obtain the necessary approvals needed to implement a green-skills focused curriculum.

The group reached consensus on adding three new green modules to the steamfitter apprenticeship. These modules focus on Green Technologies, Energy Management Systems, and Customer Service and Marketing of Green Technologies.

CURRICULUM DEVELOPMENT

The design team, consisting of industry representatives and instructors, worked through September 2011 to develop student learning plans, teaching plans, learning materials and assessment strategies for use in the apprenticeship related instruction classroom. The three modules can be incorporated into existing apprenticeship programs to meet the needs of local employers. Pending approval, beginning in the fall semester of 2011, the three modules will be available to incorporate into various semesters during the four-year, eight-semester (640 hours) related instruction portion of the apprenticeship programs offered at

Chippewa Valley Technical College, Fox Valley Technical College, Madison College, Mid-state Technical College, Northeast Wisconsin Technical College and Milwaukee Area Technical College. In 2011 – 2012, the new modules will benefit more than 350 Steamfitter Construction and Steamfitter Service apprentices, and be made available to journey workers through special upgrade sessions.

STATE COMMITTEE APPROVAL

The State Apprenticeship Committee will hear a presentation regarding the new curriculum at their October 2011 meeting. A recommendation for approval of the new curriculum to the Wisconsin DWD BAS is anticipated at that meeting. Wisconsin DWD BAS staff will then act on that recommendation by approving the new curriculum with green modules integrated into various semesters of related instruction.

ADDITIONAL INFORMATION

Project documents, resources and information can be found at <http://sage.wisconsin.gov>.

For more information, please contact:

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HOW TO USE THIS GUIDE:

This Instructor Guide is designed to help you teach the learning plans included in this module. A learning plan is designed to guide the student through the learning process, and is provided to the student in the Student Learning Guide for this module. This instructor guide includes the information provided to students in the Student Learning Guide, along with notes and information to help you teach each learning plan.

The learning plans in this instructor guide include the following components:

Overview

The Learning Plan Overview describes what the apprentice will learn and why it is important.

Competency

Each learning plan targets a competency which reflects a skill identified by industry as important to the apprentice's success on the job. A competency is a major skill or ability that the learner will be able to do as a result of completing the learning plan.

Performance Standards

Under each competency, you will find information describing how the apprentice will demonstrate the competency, such as by writing a report or giving a presentation. You will also find the criteria that will be used to evaluate their performance. Encourage students to review this information at the start of each learning plan to help guide their learning.

Learning Objectives

Learning objectives are the supporting knowledge and skills needed to perform the competency and can serve as benchmarks towards mastery of the competency.

Learning Activities

The learning activities describe the activities that the apprentices will do in and out of class to master the learning objectives, and ultimately the competency. You may decide to modify or add additional learning activities to meet the needs of your class.

Teaching Notes

For each learning activity you will find notes and suggestions on how to guide the apprentices as they complete the activity.

Assessment Activities

The assessment activities describe the activities that apprentices will complete to demonstrate mastery of the competency, according to the performance standards defined for the competency.

Learning Materials

In each learning plan, you will find information sheets and activity sheets designed to support the learning activities. You may wish to provide alternative or additional materials as needed.

Performance Assessment Task

At the end of each learning plan you will find a Performance Assessment Task. A Performance Assessment Task includes directions on how to complete the assessment and a scoring guide. Encourage students to review the directions and the criteria detailed in the scoring guide prior to beginning the assessment activity, and to use the scoring guide to self-assess their work prior to submitting it to you. You can then use the Performance Assessment Task to evaluate their work and provide feedback on their performance.



Energy Management Systems

Course Outcome Summary

Course Information

Organization	DWD
Developers	Steamfitter Development Team
Potential Hours of Instruction	5

Description

In this module, steamfitter service apprentices and/or journey workers will learn about the functions of energy management systems and how they can be used to control energy use and reduce costs.

Target Population

This module is designed to be incorporated into the Apprenticeship curriculum for Steamfitter Service Apprentices and Journey Workers.

Prerequisites

Green Technologies Module

Competencies

1. Summarize the role of energy management systems in controlling energy use and reducing heating and cooling costs

You will demonstrate your competence:

- 1.a. by illustrating how energy management systems control energy use and reduce costs
- 1.b. given a case study and an energy management system diagram

Your performance will be successful when:

- 1.a. you explain how an energy management system controls system components
- 1.b. you describe the steps in conducting an energy audit
- 1.c. you analyze the results of an energy audit
- 1.d. you illustrate how energy management systems can be programmed to reduce energy use in response to an energy audit
- 1.e. you describe how effective use of an energy management system could result in potential cost savings in a variety of manufacturing situations
- 1.f. you use correct terminology

Learning Objectives

- a. Define terms related to energy management systems
- b. Identify components of energy management systems
- c. Summarize the purpose of an energy audit
- d. Explain how energy management systems can be used to control energy use
- e. Explain how energy management systems can be used to reduce heating and cooling costs



Energy Management Systems

Green Modules for Steamfitter Apprenticeship

Learning Plan 1

Overview

In this learning plan you will explore how energy management systems are used to control energy use and reduce costs.

Target Competency

Summarize the role of energy management systems in controlling energy use and reducing heating and cooling costs

You will demonstrate your competence:

- by illustrating how energy management systems control energy use and reduce costs
- given a case study and an energy management system diagram

Your performance will be successful when:

- you explain how an energy management system controls system components
- you describe the steps in conducting an energy audit
- you analyze the results of an energy audit
- you illustrate how energy management systems can be programmed to reduce energy use in response to an energy audit

- you describe how effective use of an energy management system could result in potential cost savings in a variety of manufacturing situations
- you use correct terminology

Learning Objectives

- Define terms related to energy management systems
- Identify components of energy management systems
- Summarize the purpose of an energy audit
- Explain how energy management systems can be used to control energy use
- Explain how energy management systems can be used to reduce heating and cooling costs

Total Estimated Lesson Time: 3-5 hours. Instructors can modify activities to meet local needs and time available.

Learning Activity		Teaching Notes
1	PREVIEW the overview and performance expectations for this learning plan to see why it is important, what you will learn, and how you will be assessed. Give special attention to the introduction, competency, criteria, conditions, and learning objectives. BRAINSTORM a list of trends in green technologies in residential, commercial, and industrial applications.	TIME: 10 minutes MATERIALS: Student Learning Guide NOTES: Point out the lesson competency and performance standards and explain to learners that these describe what they will know and be able to do upon successful completion of the lesson.
2	BRAINSTORM a list of energy management strategies.	TIME: 20 minutes MATERIALS: White Board or Flip Chart and markers NOTES: Lead the class in brainstorming a list of energy management strategies for residential, commercial, and industrial applications.
3	READ assigned sections in your <i>Green Awareness</i> textbook.	TIME: 30 minutes MATERIALS: Textbook NOTES: Assign reading sections that relate to energy management in your region. [Section 1 p. 1-11]
4	COMPILE a list of key terms related to energy management. ADD these terms to your Glossary of Terms worksheet included in this learning plan.	TIME: 30 minutes MATERIALS: Glossary of Terms worksheet NOTES: Have students share definitions of key terms. Discuss and revise definitions as needed.

Learning Activity		Teaching Notes
5	PARTICIPATE in a discussion about the purpose of energy audits in managing energy use and controlling costs. SUMMARIZE the steps in conducting an energy audit.	TIME: 30 minutes MATERIALS: White Board or Flip Chart and markers NOTES: Use examples or case studies to illustrate the purpose of energy audits. List the key steps in conducting an energy audit on the white board or flip chart.
6	LOCATE articles and conduct Internet research on energy management. USE the Research Worksheet to compile a list of useful websites. SHARE information about useful websites with your classmates.	TIME: 90 minutes MATERIALS: Research Worksheet NOTES: This could be a small group/team activity with each team presenting their findings to the class.
7	COMPLETE a System Diagram practice activity. Study an Energy Management System Diagram. Locate the key components of the system and explain how they work.	TIME: 30 minutes MATERIALS: System Diagrams NOTES: This activity could be done in pairs or small groups
8	PARTICIPATE in a discussion on programming energy management systems to reduce energy costs.	TIME: 30 minutes MATERIALS: Examples of Energy Management System diagrams NOTES: Use one or more examples of energy management system diagrams. Point out key components and lead a discussion on how energy management systems can control energy use and reduce costs.
9	COMPILE a list of guidelines for selecting and using energy management system applications.	TIME: 30 minutes MATERIALS: White Board or Flip Chart and markers NOTES: Compile the list as a class. Refer to items included in the HVAC section of the text.
10	REVIEW the Energy Management Case Study Performance Assessment Task. Read the directions and review the criteria detailed in the scoring guide.	TIME: 20 minutes MATERIALS: Energy Management Case Study Performance Assessment Task NOTES: Review the Performance Assessment Task

Assessment Activity		Teaching Notes
1	Submit your Energy Management Case Study assessment to your instructor for review and feedback.	

Learning Materials/Objects

System Diagram Examples. **Description:** Locate diagrams from vendors, online resources, or the textbook that relate to what is being taught.

Glossary of Terms. **Description:** Terms related to Energy Management.

Energy Management Research Worksheet. **Description:** Worksheet to compile information about useful resources.

Case Studies. **Description:** Case Studies. Description: Locate case studies and project profiles online.

LEED Project Profiles: <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1721>

LEED Project Directory: <http://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx?CMSPageID=247>

Glossary of Terms: Energy Management Systems

Directions: As you conduct your research, locate definitions for the terms listed below. Add any additional terms that you find related to your research topic.

Term	Definition
LEED	
Energy Audit	
Energy Management	
Energy Monitoring	
BTU	
Flow meter	
Sensor	



Energy Management Systems Research Worksheet

Directions: As you conduct your research, add the websites that you find most useful to the list below. Write a brief description. Add to the list of keywords

List of keywords to use in your search:

- Energy Management Systems
- Energy Audit
- LEED
- Green Building

Website Title	Website URL	Description
U.S. Green Building Council LEED	http://www.usgbc.org/Default.aspx	
Functional Devices	http://www.functionaldevices.com/pdf/pcenergy/wiring.pdf	
Site Diagrams	http://ems3.com/site-diagrams/	
Building Energy Monitoring and Management Systems	http://www.ake.com.cn/proView.Asp?lng=ken&ID=265	

Performance Assessment Task 1

Energy Management Case Study

Evaluators Instructor, Peer

Target Competency Summarize the role of energy management systems in controlling energy use and reducing heating and cooling costs

Directions

1. Locate case studies and project profiles online or use one provided by your instructor.

LEED Project Profiles: <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1721>

LEED Project Directory: <http://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx?CMSPageID=247>

2. Read through the case study scenario and study the system diagram
3. Take note of important information and data
4. Determine the problem to be solved (customer or building)
5. Summarize the research conducted to solve the problem
6. Summarize the implementation of the solution
7. Summarize the results
8. Compile your findings in a written report
9. Self-assess your Case Study Response using the scoring guide prior to submitting to your instructor

Scoring Guide

Criteria		Ratings	
1.	you explain how an energy management system controls system components	met	not met
2.	you describe the steps in conducting an energy audit	met	not met
3.	you analyze the results of an energy audit	met	not met
4.	you illustrate how energy management systems can be programmed to reduce energy use in response to an energy audit	met	not met
5.	you describe how effective use of an energy management system could result in potential cost savings in a variety of manufacturing situations	met	not met
6.	you use correct terminology	met	not met

Grade _____

Name _____ Date _____

Evaluator's Signature _____ Date _____

Comments: