

Steamfitter Apprenticeship

Green Modules for Steamfitter Apprenticeship

Module 1: Green Technologies

Instructor Guide



Wisconsin Department of Workforce Development

Bureau of Apprenticeship Standards

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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>.

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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.



Green Technologies

Course Outcome Summary

Course Information

Organization	DWD
Developers	Steamfitter Development Team
Potential Hours of Instruction	10

Description

In this module, steamfitter apprentices and/or journey workers will learn about the design and operation of new green technologies.

Target Population

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

Textbooks

Green Awareness. Ferris State University College of Technology. 2008. **ISBN:** 1-930044-26-7.

Competencies

1. Summarize trends in green technologies for the steamfitter trade for your region

You will demonstrate your competence:

- 1.a. in a written report summarizing trends in your region

Your performance will be successful when:

- 1.a. you classify residential, commercial and industrial applications
- 1.b. you highlight the main features of each technology
- 1.c. you describe why the technology is appropriate for different regions and situations
- 1.d. you summarize the future trends for each technology
- 1.e. you use appropriate terminology

Learning Objectives

- a. Describe regional characteristics that impact trends
- b. Identify green technologies used in your region
- c. Distinguish between residential, commercial and industrial applications and requirements
- d. Define terms related to green technologies in the steamfitter trade

2. Compare the design and operation of various green technology options

You will demonstrate your competence:

- 2.a. by completing a comparison chart on selected green technologies
- 2.b. in a presentation/discussion on green technologies

Your performance will be successful when:

- 2.a. you select three green technologies to compare
- 2.b. you highlight the main features of each technology
- 2.c. you compare the key features of each technology

2.d. you describe limits on technology applications for different regions and locations (codes, geography, local conditions etc.)

2.e. you use correct terminology

2.f. you summarize your conclusions

Learning Objectives

- a. Describe key features of each technology
- b. Compare the similarities and differences between technologies
- c. Describe potential limits on using green technologies in various regions and locations
- d. Verify local codes that pertain to green technologies
- e. Identify the variations in technologies included in each main group (solar, geothermal, high efficiency, proprietary, ala carte systems)
- f. Define terminology related to green technologies



Trends in Green Technologies

Green Modules for Steamfitter Apprenticeship

Learning Plan 1

Overview

In this learning plan you will research trends in green technologies, with a focus on technologies that are becoming popular in your region.

Target Competency

Summarize trends in green technologies for the steamfitter trade for your region

You will demonstrate your competence:

- in a written report summarizing trends in your region

Your performance will be successful when:

- you classify residential, commercial and industrial applications
- you highlight the main features of each technology
- you describe why the technology is appropriate for different regions and situations
- you summarize the future trends for each technology
- you use appropriate terminology

Learning Objectives

- Describe regional characteristics that impact trends
- Identify green technologies used in your region
- Distinguish between residential, commercial and industrial applications and requirements
- Define terms related to green technologies in the steamfitter trade

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.	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 trends in green technologies in residential, commercial, and industrial applications.	TIME: 20 minutes MATERIALS: White board or flip chart and markers NOTES: Have students participate in a class brainstorming session to develop a list of green technologies and the trends that they are seeing in residential, commercial and industrial applications.
3	HIGHLIGHT the key terms related to green technologies that appear on the Brainstorming List. ADD these terms to your Glossary of Terms worksheet included in this learning plan. You will locate definitions for these terms and you conduct research on your topic.	TIME: 20 minutes MATERIALS: Brainstorming list from previous activity NOTES: Use a different colored marker to highlight key terms.
4	READ assigned sections in your <i>Green Awareness</i> textbook.	TIME: 30 minutes MATERIALS: <i>Green Awareness</i> textbook Section II - HVACR NOTES: Assign reading sections that relate to green trends in your region.
5	LOCATE articles and conduct Internet research to explain the advantages and disadvantages of various technologies. 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 looking at a different technology and presenting their findings to the class.

Learning Activity		Teaching Notes
6	COMPLETE the Classification Chart to record key features of green technologies that you find in your research.	TIME: 60 minutes MATERIALS: Classification Chart NOTES: Provide product descriptions or websites for various products. Lead a discussion about the pros and cons of each product.
7	PARTICIPATE in a class discussion on the process of conducting an energy audit. Determine the potential energy savings of a particular situation based on a case study identified in your research.	TIME: 30 minutes MATERIALS: Classification Chart NOTES: Select and use a case study situation from research on green technologies. Take students through the process of conducting an energy audit. Explain how to determine the amount of energy is being used and to identify potential cost savings through energy management and/or green technologies.
8	REVIEW the Green Trends Report Performance Assessment Task. REVIEW report formatting requirements and guidelines.	TIME: 30 minutes MATERIALS: Green Trends Report Performance Assessment Task NOTES: Provide students with guidelines and requirements for report formatting.

Assessment Activity		Teaching Notes
1	SUBMIT your Green Trends Report to your instructor for review and feedback.	

Learning Materials/Objects
<i>Glossary of Terms.</i> Description: Glossary of Terms Worksheet.
<i>Research Worksheet.</i> Description: Use the worksheet to record information on useful resources.
<i>Classification Chart Worksheet.</i> Description: Use to organize information gathered through research.
<i>Report Writing Resources.</i> Description: Provide students with information about report writing for steamfitters.

Glossary of Terms: Trends in Green Technologies

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
Energy Efficiency Ratio	
Coefficient of Performance	
Energy Conservation Measures	
Energy Management Systems	
Energy Cost Saving Measures	
Energy Audit	
Geothermal Systems	
Solar Heating and Cooling	
High Efficiency Refrigeration	
High Efficiency Boilers	
High Efficiency Air Conditioning	
High Efficiency Water Heaters	
Fuel Cell	
Greenhouse Gases	



Trends in Green Technologies 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:

- Sustainability
- Geothermal Heating Systems
- Energy Efficiency
- Energy Conservation
- Energy Cost Savings
- Energy Management Systems
- High Efficiency Technologies

Website Title	Website URL	Description
HCAR The News	http://www.achrnews.com/	
Focus on Energy	http://www.focusonenergy.com/	
Green Building Encyclopedia	http://www.whygreenbuildings.com/glossary.php	Glossary of Green Building Terms
Green Initiative - Terms and Definitions	http://www.lvchamber.com/green/sustainability	Las Vegas Chamber of Commerce Las Vegas, NV
Green Source: The magazine of sustainable design	http://greensource.construction.com/	
U.S. Green Building Council	http://www.usgbc.org	

Green Technologies Classification Chart

Directions: As you conduct your research, use this Classification Chart to highlight the main features of each technology and describe how it is used in residential, commercial and industrial applications

Green Technologies	Residential	Commercial	Industrial
Solar Water Heating			
Solar Air Heating and Cooling			
Geothermal Systems			
High Efficiency Toilets and Urinals			
Energy Efficient Lighting			
Energy Efficient Heating and Cooling			
Energy Management Systems			

Performance Assessment Task 1

Green Trends Report

Evaluators Instructor, Peer

Target Competency Summarize trends in green technologies for the steamfitter trade for your region

Directions

For this assessment you will write a report on green trends in your region.

1. Use the Research Worksheet to conduct online research on green trends.
2. Through your research, identify two or three main trends in your region. Use these trends as the focus of your report.
3. Review the criteria detailed in the scoring guide prior to writing your report.
4. Format your report according to APA guidelines
5. Use the scoring guide to self-check your report before submitting it to your instructor.

Scoring Guide

Criteria		Ratings	
1.	you classify residential, commercial and industrial applications	met	not met
2.	you highlight the main features of each technology	met	not met
3.	you describe why the technology is appropriate for different regions and situations	met	not met
4.	you summarize the future trends for each technology	met	not met
5.	you use appropriate terminology	met	not met
6.	you reference at least five sources	met	not met
7.	report meets formatting guidelines	met	not met
8.	report is six-10 pages in length	met	not met
9.	report exhibits 100% correct spelling, grammar, and punctuation	met	not met

Grade _____

Name _____ Date _____

Evaluator's Signature _____ Date _____

Comments:



Green Technologies Design and Operation

Green Modules for Steamfitter Apprenticeship

Learning Plan 2

Overview

In this learning plan you will compare the design and operation of various green technology options.

Target Competency

Compare the design and operation of various green technology options

You will demonstrate your competence:

- by completing a comparison chart on selected green technologies
- in a presentation/discussion on green technologies

Your performance will be successful when:

- you select three green technologies to compare
- you highlight the main features of each technology
- you compare the key features of each technology
- you describe limits on technology applications for different regions and locations (codes, geography, local conditions etc.)

- you use correct terminology
- you summarize your conclusions

Learning Objectives

- a. Describe key features of each technology
- b. Compare the similarities and differences between technologies
- c. Describe potential limits on using green technologies in various regions and locations
- d. Verify local codes that pertain to green technologies
- e. Identify the variations in technologies included in each main group (solar, geothermal, high efficiency, proprietary, ala carte systems)
- f. Define terminology related to green technologies

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.	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	REVIEW the technologies identified in Learning Plan 1: Trends in Green Technologies. Select three green technologies to compare in depth. Select technologies that would be used for a similar application (i.e. Commercial hot water heating) for your comparison.	TIME: 20 minutes MATERIALS: Classification Charts from LP 1 NOTES: This assignment could be completed individually or in small groups.
3	CONDUCT additional research on your three technologies. From your job site experience, describe technologies you find in the workplace OR why they are not being used in the workplace. Use the Green Technologies Comparison Chart worksheet to compile your findings.	TIME: 60 minutes MATERIALS: Green Technologies Comparison Chart NOTES: Provide product descriptions or websites for various products.

Learning Activity		Teaching Notes
4	SHARE your conclusions with the class.	TIME: 30 minutes MATERIALS: Green Technologies Comparison Charts NOTES: Have students provide copies of their completed charts to the rest of the class.
5	PARTICIPATE in a discussion. HIGHLIGHT the green technologies that seem to be the most well-suited to your region.	TIME: 60 minutes MATERIALS: Local examples NOTES: Lead a discussion about the pros and cons of each technology for your region.
Assessment Activity		Teaching Notes
1	Submit your Green Technologies Comparison assessment to your instructor for review and feedback.	

Learning Materials/Objects
<i>Vendor Information List.</i> Description: Provide vendor information, websites on each technology.
<i>Comparison Chart Worksheet.</i> Description: Use for Performance Assessment.

Green Technologies Comparison Chart

Directions: Select three green technologies from your Classification Chart in Learning Plan 1 that you wish to compare. Conduct additional research on these technologies. If possible, interview experts on installing and maintaining the technology. Use this chart to record your findings. Summarize your conclusions and present your findings to the class.

	Technology #1	Technology #2	Technology #3
Application (i.e. commercial water heating, residential radiant heat)			
Site Considerations			
Installation Considerations			
Cost Considerations			
Regional Considerations			
Code Compliance			
Maintenance Considerations			
Other Considerations			

Conclusions:

Performance Assessment Task 2

Green Technologies Comparison

Evaluators Instructor, Peer

Target Competency Compare the design and operation of various green technology options

Directions

Use the Comparison Chart Worksheet to compile information from your research comparing the design and operation of green technologies. Summarize your conclusions and share your results with the class.

Scoring Guide

Criteria		Ratings	
1.	you select three green technologies to compare	met	not met
2.	you highlight the main features of each technology	met	not met
3.	you compare the key features of each technology	met	not met
4.	you describe limits on technology applications for different regions and locations (codes, geography, local conditions etc.)	met	not met
5.	you use correct terminology	met	not met
6.	you summarize your conclusions	met	not met

Grade _____

Name _____ **Date** _____

Evaluator's Signature _____ **Date** _____

Comments: