

Safety and Health in Wind Energy

**Strategies for Small Wind Energy Businesses
Targeted Topic Training**

Facilitator Manual Classroom

Developed by the University of Wisconsin Oshkosh,
Center for Career Development and Employability Training

In cooperation with the Occupational Safety and Health Administration
and funded by a Susan B. Harwood Grant



**Center for Career Development
and Employability Training
(CCDET)**

The vision of CCDET is to be the provider of choice for innovative training and support services to Wisconsin public agencies.

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The University of Wisconsin Oshkosh is an equal opportunity employer. If you have a disability and need information in an alternate format, or need it translated into another language, please contact the University of Wisconsin Oshkosh, Center for Career Development and Employability Training (CCDET) at windtrng@uwosh.edu. A contact person at this e-mail address is available to answer questions related to this training material, assist you in completing any activity that you are having difficulty with and/or provide explanation of anything else about this training material. Further information regarding this program can be found on the website: www.uwosh.edu/ccdet/wind_training.

Disclaimer. Although the information and recommendations contained in this publication have been compiled from sources believed to be reliable, CCDET makes no guarantee as to, and assumes no responsibility for, the correctness, sufficiency or completeness of such information or recommendations. Other or additional safety measures may be required under particular circumstances. Any reference to actual companies is unintentional and should be construed as fictional.

Table of Contents

Introduction.....	2
Classroom Training.....	6
Module 1: Introduction to the Ten Critical Processes.....	9
Module 2: The Job Hazard Analysis.....	18
Module 3: Recognizing and Controlling Hazards from Working at Heights	30
Module 4: Recognizing and Controlling Electrical Hazards	45
Module 5: Recognizing and Controlling Excavation and Trenching Hazards	59
Module 6: Recognizing and Controlling Struck-By Hazards	72
Module 7: Recognizing and Controlling Hazards from Exposed Environments.....	85

INTRODUCTION

This *Safety and Health in Wind Energy* training program is sponsored by a grant made available through the Susan Harwood Training Grant Program. This grant program is administered by the United States Department of Labor, Occupational Safety and Health Administration (OSHA).

The purpose of the Susan Harwood Training Grant Program is to provide training and education programs that will help employers and workers recognize, avoid and prevent safety and health hazards in their workplaces.

This particular training program was developed by the University of Wisconsin Oshkosh's Center for Career Development and Employability Training (CCDET). Recognized as a leader in regional and state training for more than two decades, CCDET offers creative solutions and support services to federal, state and local organizations. CCDET creates new approaches and modify existing strategies, providing training and support services to meet the unique needs of agencies and organizations, both large and small.

The purpose of the *Safety and Health in Wind Energy* training program is to address hazards related to the installation, maintenance and demolition of wind turbines. During this program, employees will gain the knowledge and basic skills to:

- Identify the ten critical processes used in constructing, maintaining and demolishing wind turbines, particularly as they relate to their worksites.
- Identify the general safety and health hazards associated with these ten processes.
- Perform a job hazard analysis of the processes used at their worksites to identify specific hazards.
- Recognize regulatory standards and requirements pertaining to the hazards they find at their worksites.

- Identify ways to control and eliminate the hazards they find at their worksites as a means of preventing injuries and deaths.
- Recognize obstacles to using safe work practices at their worksites and identify suggestions for addressing them.

The content in this training program will reflect the needs and characteristics of small businesses and their workers in the wind energy industry. You will receive a variety of resources and tools so you can take the content from this program and use it on the job in two ways. First you can use the materials yourself to practice your own job in a safe manner. Second, you can use the materials to teach others at your worksite the important principles of working in a safe manner.

The following people deserve recognition and thanks for their assistance in reviewing this program and providing suggestions for improvement.

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Demonstration of Harnesses

Lin Phonthongsy
Troy Erickson

Outdoor Climbs

Joshua Goede—Ladder Climber
Todd Sturz—Peg Climber

Indoor Climb

Aaron VandenBloomer—Climber
Kyle Guthrie—Photographer

Struck-By Demonstration

Aaron VandenBloomer—Climber
Joshua Goede—Ground Worker

Delivery Considerations

The *Safety and Health in Wind Energy* training program can be delivered in three ways.

- **Classroom Train-The-Trainer.** With this method, certified safety trainers will use the materials to train a one-day class of owners, managers and trainers in the wind energy business. The goal of this training is twofold. First, participants will learn how to recognize and control hazards in the installation, maintenance and demolition of wind turbines. Second, participants will learn how to teach their own employees how to recognize and control these hazards.
- **Classroom.** With this method, owners and managers in the wind energy business will use the materials to teach a one-day class to their own employees. The goal of this training is to teach employees how to recognize and control hazards at their worksites.
- **Tailgate Sessions.** With this method, owners and managers in the wind energy business will use the materials to conduct tailgate sessions with small groups of employees. These sessions can be conducted either in a meeting room or at the worksite. Ideally, they will be conducted in a *just-in-time* manner so that employees learn how to recognize and control hazards at the time they might be encountering them.

Program Materials

Four resources support the *Safety and Health in Wind Energy* training program.

- **Facilitator Manual.** This is the manual you are reading now. It is intended to be used by two levels of facilitator. First, a professional safety trainer will use this manual to present the one-day training. Second, small business employers can use the guide when they conduct further classroom training back at their worksites.

The Facilitator Manual is written for and targeted to the small business employer. Because the professional trainers are more experienced in facilitation, they will be able to extrapolate the information they need from the Facilitator Manual when they teach the course. The Facilitator Manual can be found on your *Tools and Resources* CD, and contains five files:

- ◆ Suggestions for delivering the course in a one-day classroom training.
- ◆ Suggestions for delivering the course in short tailgate sessions.
- ◆ PowerPoint presentation and Videos
- ◆ The pre- and post-course tests
- ◆ The course evaluation

- **Participant Booklet.** This booklet will be used by two levels of participants. First, small business employers (and some employees who attend class) will receive the booklet in their one-day training from the University of Wisconsin Oshkosh. It will be a spiral-bound notebook for participants to follow along with the class activities and take notes.

Second, employees will receive the booklet when they are being trained by their employer. Participants in the one-day class will also be given a *Tools and Resources* disk that contains a digital copy of the Participant Booklet. When these participants return to their worksites, they will have the materials they need to train and coach other employees.

The Participant Booklet contains the following:

- ◆ A brief introduction to the University of Wisconsin Oshkosh, the Center for Career Development and Employability Training, the Susan Harwood Grant and the course.
 - ◆ The materials needed to participate in the one-day class including learning objectives, key terms, learning activities and tools and worksheets.
-
- **Tools and Resources CD.** This disk will be given to participants who attend the one-day train-the-trainer program. It will contain the tools and resources that relate to the training program, including the following.
 - ◆ This Participant Booklet
 - ◆ The PowerPoint slides required to teach the classroom version of the program
 - ◆ The videos used in the program
 - ◆ A Facilitator Manual that gives you step-by-step instructions for conducting this class for other employees at your worksite
 - ◆ An additional Facilitator Manual that gives you instructions for teaching this material in shorter tailgate sessions at your worksite
 - ◆ All of the forms introduced in this program
 - ◆ A variety of OSHA forms related to the topics in this program
 - ◆ A variety of publications related to the topics in this program
 - ◆ A list of resources where you can find additional information
 - ◆ The pre-course test
 - ◆ The post-course test
 - ◆ The course evaluation

 - **PowerPoint Slides.** There will be PowerPoint slides available for use with an LCD projector. These will be used by the facilitator in the one day training program. They will also be available for participants on the *Tools and Resources* CD in the event that participants want to use the slides during their onsite training.

CLASSROOM TRAINING

Preparing to Teach the Program Using the Classroom Format

Since the classroom format will be taught in one day, it is important to prepare ahead of time for the entire day. Following is a checklist to help facilitators prepare.

- Reserve the room in which you will be training.
- Read the Facilitator Manual so that you can get a feeling for the flow of the program.
- Read the Participant Booklet so that you are prepared to refer to corresponding material, especially activities, during program delivery.
- Make one Participant Booklet for each employee in the training. The electronic files for the Participant Booklet are on the *Tools and Resources* CD.
- Rehearse introductions, transitions and conclusions with the corresponding visual aids.
- Arrange to have the needed equipment in the training room. Check all equipment before the training. Make sure it is operating properly and is set up the way you want it.
- Load the entire *Tools and Resources* CD that came with this program onto your C (hard) Drive. This will ensure that your PowerPoint presentations will run efficiently.
- Locate the three videos you will show during the class and test them to make sure they properly play. You will use the first video, called *How to Properly Put on a Fall Arrest System*, in Module 3, the second video, called *Arc Flash Explosion* in Module 4, and the third video, called *Struck By*, in Module 6. All three videos are on your *Tools and Resources CD* in the *Facilitator Materials* folder, then in the *Videos* folder, then in the *Classroom Videos* folder.
- Make sure that pre- and post-program tests are printed and ready to distribute. The electronic files for the tests can be found in the Facilitator Manual file on your *Tools and Resources CD*.
- Make sure that the course evaluations are printed and ready to distribute. The electronic files for the course evaluations can be found in the Facilitator Manual file on your *Tools and Resources CD*.
- Order an OSHA poster (or use one that you have at your worksite) and bring it to class. Forms can be ordered from www.osha.gov/pls/publications/publication.html.

Materials and Equipment List for the Classroom Format

Following is a checklist of materials and equipment that facilitators will need to deliver the classroom session.

- One Participant Booklet for each participant and facilitator
- Flipchart with flipchart paper
- Flipchart markers (mainly black, blue, green, purple, and brown—bring a few red and/or orange markers for accent)
- Electrical plug strip with surge and trip protection
- Watch, clock, and/or timer (for timing activities, breaks, and lunches)
- Laptop or computer station with projection unit to display PowerPoint slides; PowerPoint 97 or higher must be loaded on the computer
- Screen
- A copy of the OSHA 1926 Standard book
- PowerPoint slides
- Sign-in sheet with printed name
- A set of your company's fall arrest gear for demonstrating in Module 3.
- If your company has lockout/tagout procedures, make one copy for each participant in the class. Plan to use these procedures as referenced on page 45 of this guide.
- If your company uses its own hand signals for communicating at job sites, make one copy of them for each participant in the class. Plan to use these procedures as referenced on page 72 of this guide.
- The pre- and post-course tests
- The course evaluation forms
- The OSHA Poster

Note: Sign-in sheets and evaluation forms must be returned to:

Susan B. Harwood Grant Administrator
University of Wisconsin Oshkosh, CCDET
800 Algoma Road
Oshkosh, WI 54901

Schedule for the Classroom Training

Safety and Health in Wind Energy

Module #	Module Title	Time
1	Module 1: Introduction to the Ten Critical Processes	8:30 – 9:05 AM (35 minutes)
2	Module 2: The Job Hazard Analysis	9:05 - 9:50 AM (45 minutes)
<i>Break</i>		9:30 - 10:05 AM (15 minutes)
3	Module 3: Recognizing and Controlling Hazards from Working at Heights	10:05 - 11:10 AM (65 minutes)
4	Module 4: Recognizing and Controlling Electrical Hazards	11:10 AM - 12:15 PM (65 minutes)
<i>Lunch</i>		12:15 - 1:15 PM (60 minutes)
5	Module 5: Recognizing and Controlling Excavation and Trenching Hazards	1:15 - 2:20 PM (65 minutes)
<i>Break</i>		2:20 - 2:30 AM (10 minutes)
6	Module 6: Recognizing and Controlling Struck-By Hazards	2:30 - 3:35 PM (65 minutes)
<i>Break</i>		3:35 - 3:45 PM (10 minutes)
7	Module 7: Recognizing and Controlling Hazards from Working in Exposed Environments	3:45 - 4:35 PM (50 minutes)
		Total = 390 minutes (6.5 hours of instruction)

MODULE 1

INTRODUCTION TO THE TEN CRITICAL PROCESSES

Module Purpose:

To provide employees with an overview of the course, and to introduce the ten critical processes involved in installing, maintaining and decommissioning wind turbines.

Objectives:

Upon completion of this module, employees will be able to:

- State the course goals.
- Identify the ten critical processes involved in installing, maintaining and decommissioning wind turbines.

Recommended Time: 35 minutes

Pages from Participant Booklet: 1-7

PowerPoints: 1-27

Additional Materials: One pre-course test for each participant

Recommended Agenda:

1. Introduction to the day—Presentation (5 minutes)
2. Pre-course test—Individual Activity (20 minutes)
3. Introduction to the ten critical processes—Discussion (10 minutes)

Module 1: Recommended Approach for Teaching

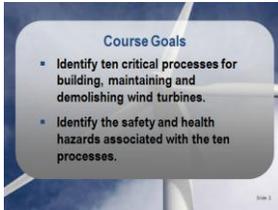
1. Introduction to the Day: Presentation

 5 minutes

Cues	What to Do or Say
<p>PPT-1</p> 	<ul style="list-style-type: none">■ Prior to the class, place one Participant Booklet at each place where an employee will be sitting.■ Use PPT-1 to set up and test the LCD projector. Leave this slide on the screen as employees arrive for the class.■ Start the program promptly at the scheduled time.■ Welcome employees and thank them for their commitment to this class, which will help them do their jobs more safely.■ Explain that the class today will help them identify and address hazards on their jobs.■ Refer employees to their Participant Booklets.■ Tell them they will be using these booklets throughout the day. The booklets are theirs to keep, so they should feel free to write in them and make them their own.
<p>Pages 1 through 4</p>	<ul style="list-style-type: none">■ Quickly introduce employees to Pages 1 through 4. Explain that these pages contain some general information about the course. They may want to review these pages on their own.
<p>Page 5</p>	<ul style="list-style-type: none">■ Refer employees to Page 5 of their booklets. Explain that there are seven modules in today's program.■ Each module will have an introductory page like this one that gives the module overview and objectives.

Page 6

PPT-2



PPT-3



PPT-4



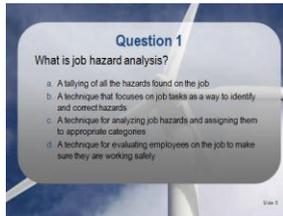
- Refer employees to Page 6. Tell them that there are six primary goals for today's class.
- Use PPT-2 through PPT-4 to introduce the goals.

2. Pre-Course Test: Individual Activity

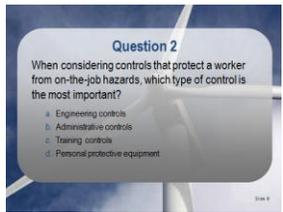
 20 minutes

Cues	What to Do or Say
	<ul style="list-style-type: none">■ Tell employees that they will now be taking a pre-course test.■ Explain that an important part of any training program is learning.■ At the end of the program, they may have a subjective sense of how much they've learned, but it can also be helpful to measure learning objectively.■ Tell them that, by taking this pre-test, they will be able to get a measurement of their current knowledge of the program content.■ At the end of the program, they will take a post-test. In this way, they will be able to objectively determine how much knowledge they have gained in the program.
Pre-Course Test	<ul style="list-style-type: none">■ Hand out the pre-course tests.■ Allow employees about 20 minutes to complete the test.■ Periodically call time to help employees pace themselves.■ When time is up, collect the tests.
Collect Tests	<ul style="list-style-type: none">■ Tell employees that throughout the day, they will be introduced to content that will give them the answers to the questions that were in the test.
Optional Review of Test (Add 20 minutes to course time)	<ul style="list-style-type: none">■ You can review the Pre-Course test with the class. If you do this option, you need to add 20 minutes to the class time.■ Also, it is extremely important that you collect the tests before reviewing them. Employees can read the questions on the PowerPoint slides as you present them.
PPT-5 through PPT-24	<ul style="list-style-type: none">■ Use PPT-5 through PPT-24 to review the test questions.

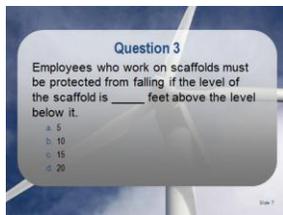
PPT-5 (animated)



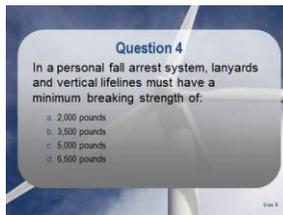
PPT-6 (animated)



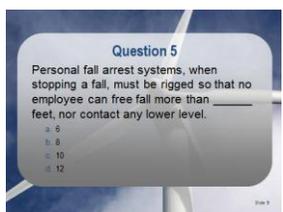
PPT-7 (animated)



PPT-8 (animated)



PPT-9 (animated)



■ Test Question 1

- Review the question, then advance the animation to reveal the answer, which is b.
- The source for this answer is Page 11 of the Participant Booklet.

■ Test Question 2

- Review the question, then advance the animation to reveal the answer, which is a.
- The source for this answer is Page 12 of the Participant Booklet.

■ Test Question 3

- Review the question, then advance the animation to reveal the answer, which is b.
- The source for this answer is OSHA 29CFR 1926.451(g)(1).

■ Test Question 4

- Review the question, then advance the animation to reveal the answer, which is c.
- The source for this answer is OSHA 29CFR 1926.502(d)(9).

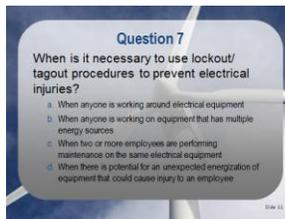
■ Test Question 5

- Review the question, then advance the animation to reveal the answer, which is a.
- The source for this answer is OSHA 29CFR 1926.502(d)(16)(iii).

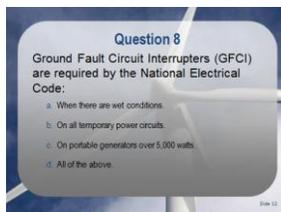
PPT-10 (animated)



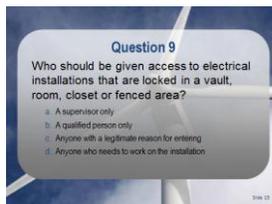
PPT-11 (animated)



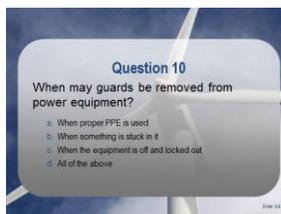
PPT-12 (animated)



PPT-13 (animated)



PPT-14 (animated)



- Test Question 6
 - Review the question, then advance the animation to reveal the answer, which is d.
 - The source for this answer is OSHA 29CFR 1926.502(d)(16).

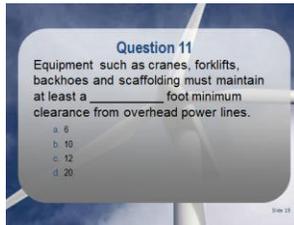
- Test Question 7
 - Review the question, then advance the animation to reveal the answer, which is d.
 - The source for this answer is OSHA 29CFR 1910.147(a)(1)(i).

- Test Question 8
 - Review the question, then advance the animation to reveal the answer, which is d.
 - The source for this answer is OSHA 29CFR 1926.404(b)(1).

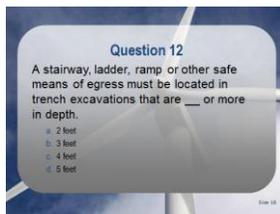
- Test Question 9
 - Review the question, then advance the animation to reveal the answer, which is b.
 - The source for this answer is OSHA 29CFR 1926.403(j)(2).

- Test Question 10
 - Review the question, then advance the animation to reveal the answer, which is c.
 - The source for this answer is OSHA 29CFR 1910.147(a)(2)(ii)(A).

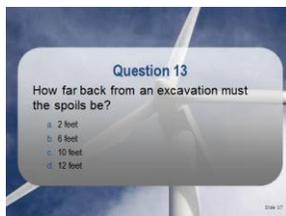
PPT-15 (animated)



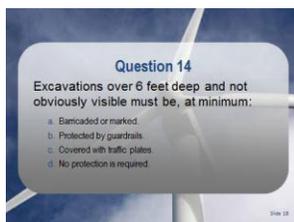
PPT-16 (animated)



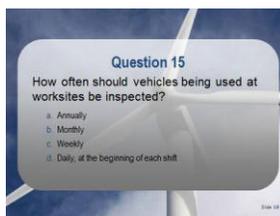
PPT-17 (animated)



PPT-18 (animated)



PPT-19 (animated)



■ Test Question 11

- Review the question, then advance the animation to reveal the answer, which is b.
- The source for this answer is OSHA 29CFR 1926.600(a)(6).

■ Test Question 12

- Review the question, then advance the animation to reveal the answer, which is c.
- The source for this answer is OSHA 29CFR 1926.651(c)(2).

■ Test Question 13

- Review the question, then advance the animation to reveal the answer, which is a.
- The source for this answer is OSHA 29CFR 1926.651(j)(2).

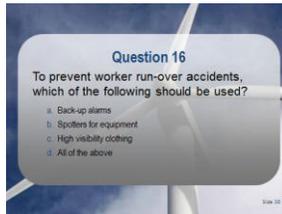
■ Test Question 14

- Review the question, then advance the animation to reveal the answer, which is a.
- The source for this answer is OSHA 29CFR 1926.501(b)(7)(i).

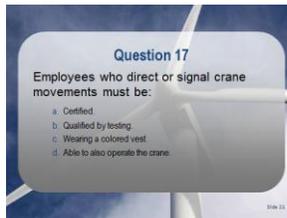
■ Test Question 15

- Review the question, then advance the animation to reveal the answer, which is d.
- The source for this answer is OSHA 29CFR 1926.601(b)(14).

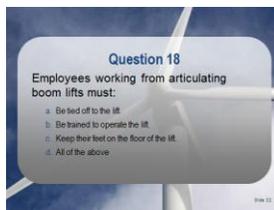
PPT-20 (animated)



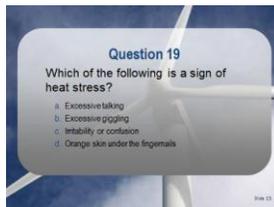
PPT-21 (animated)



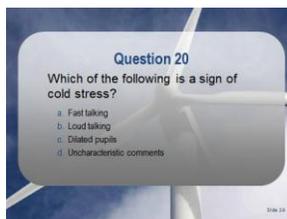
PPT-22 (animated)



PPT-23 (animated)



PPT-24 (animated)



- Test Question 16
 - Review the question, then advance the animation to reveal the answer, which is d.
 - The source for this answer is OSHA 29CFR 1926.602(a)(9).

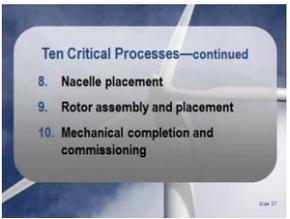
- Test Question 17
 - Review the question, then advance the animation to reveal the answer, which is b.
 - The source for this answer is OSHA 29CFR 1926.1428.

- Test Question 18
 - Review the question, then advance the animation to reveal the answer, which is d.
 - The source for this answer is OSHA 29CFR 1926.453.

- Test Question 19
 - Review the question, then advance the animation to reveal the answer, which is c.
 - The source for this answer is the OSHA Heat Stress Quick Card (on *Tools and Resources CD*).

- Test Question 20
 - Review the question, then advance the animation to reveal the answer, which is c.
 - The source for this answer is the OSHA Cold Stress Quick Card (on *Tools and Resources CD*).

3. Introduction to the Ten Critical Processes: Discussion 🕒 10 minutes

Cues	What to Do or Say
<p>Page 7</p>	<ul style="list-style-type: none">■ Refer employees to Page 7. Tell them the American Society of Safety Engineers has identified ten processes related to the building, maintaining and demolition of wind turbines.■ Ask: How many of these processes do we use at our worksites?■ Get some responses, then say that it is important to consider where the hazards are and what they might do to reduce the hazards. This can also reduce their chances of injuring or killing themselves or a colleague.
<p>PPT-25</p> 	<ul style="list-style-type: none">■ Use PPT-25 through PPT-27 to introduce the ten critical processes. When you are finished presenting the ten critical processes, ask employees if they know about OSHA’s construction focus-four.■ Get a few ideas from employees, then say the following:
<p>PPT-26</p> 	<ul style="list-style-type: none">– There are four types of common construction injuries.– These injuries are caused by falling from heights, electrical injuries, getting injured in an excavation and getting injured by being struck by something.– When you look at these ten critical processes, how are they similar to or different from OSHA’s focus four?
<p>PPT-27</p> 	<ul style="list-style-type: none">■ Get a few answers from employees, then say the following:– Except for exposure to environment, everything on this list falls into at least one of the focus four categories.– Our class today will mirror OSHA’s focus four, and we will also study exposure to the environment.

MODULE 2

THE JOB HAZARD ANALYSIS

Module Purpose:

Module 2 will introduce employees to the employer's responsibilities and the employee's rights under OSHA for a safe working environment. An important method for ensuring a safe working environment is the job hazard analysis. This module will introduce the job hazard analysis and a job hazard analysis form. Employees will be asked to select a process they commonly perform at work and prepare a job hazard analysis for it.

Objectives:

Upon completion of this module, employees will be able to:

- Recognize the employer's responsibilities under OSHA to provide a safe working environment.
- Recognize the employee's rights under OSHA to work in a safe environment.
- Describe the purpose of the job hazard analysis.
- Recognize the important components of a job hazard analysis.
- Perform a job hazard analysis on one of their work processes.

Recommended Time: 45 minutes

Pages from Participant Booklet: 8-15

PowerPoints: 28-38

Additional Materials: The OSHA poster

Recommended Agenda:

1. Introduction to OSHA's employer responsibilities and employee rights—Discussion (10 minutes)
2. Introduction to the job hazard analysis—Presentation and Discussion (10 minutes)
3. Completion of a job hazard analysis—Activity (20 minutes)
4. Introduction to a job project hazard analysis form—Demonstration (5 minutes)

Module 2: Recommended Approach for Teaching

1. Introduction to OSHA's Employer Responsibilities and Employee Rights: Discussion 10 minutes

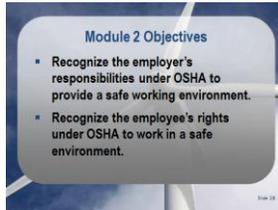
Cues

What to Do or Say

Page 8

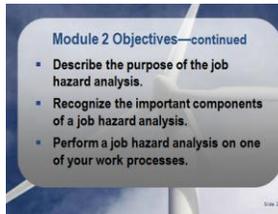
- Refer employees to Page 8. Tell them that this module will provide a framework for working safely with the ten critical processes.
- The information they learn in Module 2 can be applied throughout their jobs.

PPT-28



- Use PPT-28 and PPT-29 to introduce objectives for Module 2.

PPT-29



Page 9

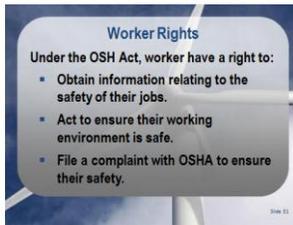
- Refer employees to Page 9. Tell them the law encourages workers to be active players in workplace safety.
- They can learn about OSHA laws anytime by going to the OSHA website.

PPT-30



- Show PPT-30 and tell employees that this is what the OSHA home page looks like.
- Encourage employees to go to the OSHA page often to learn about updates in safety and health.

PPT-31



PPT-32



Page 10

PPT-33



- Show PPT-31 and make the following points.
 - The 14 points on this page describe your rights under the OSH Act.
 - In general, they form two categories: your right to obtain information and your right to act on behalf of your safety.
- Show PPT-32 and make the following points.
 - You can go to the OSHA website anytime and learn about these worker rights under OSHA.
 - This slide gives you a snapshot of the OSHA Worker Rights Page.
- Refer employees to Page 10. Tell them that employers also have rights and responsibilities under OSHA.
- Show PPT-33 and make the following points.
 - The 15 points on this page describe what employers need to do to maintain a safe workplace.
 - In general, they form three categories: provide a safe working environment, report accidents and keep records.
- Take some time to share with employees how OSHA works with your company to provide a safe workplace.
- Following are some suggestions for things you might do.
 - Show them the OSHA poster and tell them where they can find these posters at your worksite.
 - Give them the name and phone number of your OSHA representative.

- Describe to them the relationship you have with the OSHA representative.
- Describe the policies and procedures you have in place to ensure a safe working environment.
- Tell employees how they can obtain access to the various medical and exposure records you maintain.
- Tell employees how to request your company's log of Work-Related Occupational Injuries and Illnesses (OSHA 300).
- Ask employees how they think your company is doing in providing them with the tools and information they need to be safer on the job.
- Answer any questions they have.

2. Introduction to the Job Hazard Analysis: Presentation and Discussion



10 minutes

Cues

What to Do or Say

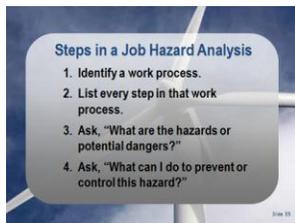
Facilitator Note

Page 11

PPT-34



PPT-35



- Because of the short amount of time for this segment, the material needs to be covered quickly. Allow a couple of minutes for each box on Page 11 with the remainder of the time going to Page 12.
- Refer employees to the top box on Page 11. Tell them that an important method for ensuring a safe working environment is the job hazard analysis.
- Ask employees what a job hazard analysis is, and get a few responses from them.
- Show PPT-34 to provide the definition of a job hazard analysis.
- Tell employees that in a job hazard analysis they would break a job down to all of its component steps, look at the potential hazards in each step, then look for ways to eliminate or control each hazard.
- Ask employees to name a typical job they do when they are at their worksites. When you get a suggestion, refer employees to the middle of page 11.
- Show PPT-35 as you introduce the four steps in a job hazard analysis.
- As you introduce each step, do the following:
 - For Step 1: Point out that they have already identified a work process in class.
 - For Step 2: Ask them to name the key sub-steps of that process. As employees name the sub steps, write them on a flipchart or chalk board.

PPT-36

Steps to Perform Work	Potential Hazards	Controls

PPT-37

Too Much Detail	Too Little Detail	Right Amount of Detail
<ul style="list-style-type: none"> <input type="checkbox"/> Get ladder from storage. <input type="checkbox"/> Get new light bulb from storage. <input type="checkbox"/> Carry ladder and light bulb to fence. <input type="checkbox"/> Place ladder under fence. <input type="checkbox"/> Pull ladder away and throw out old light bulb. <input type="checkbox"/> Remove light cover. <input type="checkbox"/> Twist light bulb counter clockwise until it is free of socket. <input type="checkbox"/> Replace old light bulb. <input type="checkbox"/> Insert new bulb into socket. <input type="checkbox"/> Turn in clockwise until lighted. <input type="checkbox"/> Replace light cover. <input type="checkbox"/> Invert ladder. <input type="checkbox"/> Carry ladder back to storage. 	<ul style="list-style-type: none"> <input type="checkbox"/> Get ladder and new light bulb. <input type="checkbox"/> Change bulb. <input type="checkbox"/> Put ladder away and throw out old light bulb. 	<ul style="list-style-type: none"> <input type="checkbox"/> Get ladder and new light bulb. <input type="checkbox"/> Turn light switch off. <input type="checkbox"/> Place ladder under light to be changed. <input type="checkbox"/> Change ladder: change bulb. <input type="checkbox"/> Put ladder back in storage.

- For Step 3: Point to each step and ask the class, what are some of the potential hazards or dangers in this step? Get some responses.
- For Step 4: Point to each hazard and ask how that hazard can be eliminated or controlled. Get some responses.

- Show PPT-36 and tell employees that when they do a job hazard analysis, they should use a form like this one.
- It's a simple form that allows them to list the job steps, the potential hazards and some possible controls.
- Tell employees that when they do a job hazard analysis, it is important for them to use the right amount of detail.

- Use PPT-37 to illustrate this point.

- The left-hand column provides way too much information. If they go into this amount of detail, they will most likely never do job hazard analyses because they will feel it takes too much time.
- The middle column shows too little detail. It will be hard to identify hazards for these tasks because they are too broad.
- The right-hand column has the correct amount of detail. This is the level of detail they should strive for when they prepare their job hazard analyses.

Page 12

- Refer employees to the bottom box on Page 11. Ask the question in the box, then get some responses. Following are some of the responses you can expect (or share).
 - Look at equipment for fire, mechanical, pneumatic, electrical or hydraulic hazards.
 - Look at the environment for noise, fall hazards, places where a person can get caught on or in between things, places where a person might overexert him/herself, places where a person can get struck by something, potential for overexposure to heat or cold, or potential for ergonomic problems.
 - Look at work practices and employee behavior such as wearing one's PPE or following lockout/tagout procedures.
- Refer employees to Page 12. Remind them that when they find a hazard on the job, it is important also to find a control.
- Tell them there are three levels of control for hazards.

PPT-38



- Show PPT-38 as you introduce the three types of control.
- When you introduce engineering controls, emphasize that these are the most preferred control.
- Ask for some examples of this type of control, which include:
 - Redesign of equipment to eliminate the hazard.
 - Substitution of equipment, material or a process.
 - Use of barriers or shields.
- Tell employees that an example of this type of control in the wind industry is assembling a tower horizontally to eliminate the need for climbing, which eliminates falling hazards.
- When you introduce administrative controls, emphasize that these are the second most preferred type of control.
- Ask for some examples of this type of control, which include:
 - Training and education.
 - Adjusting work schedules and rotating assignments to reduce exposure.
 - Maintenance.
 - Good housekeeping.
 - Lockout/tagout.
- Tell employees that an example of this type of control in the wind industry is this training program.

- When you introduce personal protective equipment as a control, emphasize that this is a control method of last resort. It is the least desirable because you aren't getting rid of the hazard; you are just protecting employees from injury in the event the hazard causes an accident.
- Ask for some examples of this type of control, which include:
 - Headgear.
 - Fall protection.
 - Hearing protection.
 - Footwear.
 - Eye and face protection.
- Tell employees that an example of this type of control in the wind industry is having a reliable fall protection system.

3. Completion of a Job Hazard Analysis: Activity

 20 minutes

Cues	What to Do or Say
<p>Facilitator Note</p> <p>Page 13</p>	<ul style="list-style-type: none">■ For this activity, allow about 10 minutes for the small groups to work on the job hazard analysis and another 10 minutes to discuss their work.■ Refer employees to Page 13. Form the class into groups of 4 to 5 people.■ Ask each group to select a work process they are all familiar with, then prepare a job hazard analysis for the process. They will have about 10 minutes to:<ul style="list-style-type: none">– Break the work process into its sub steps.– Identify the potential hazards associated with each step.– Identify possible controls for each hazard■ As employees work, walk around the room to answer their questions and to determine if they understand the assignment.■ Periodically announce the time to keep employees on track with the assignment.■ When time is up, call the groups back together as a large class and discuss what they have done.■ Following are some things you can do to facilitate the discussion.<ul style="list-style-type: none">– Comment as appropriate on the groups’ responses.– When a group identifies a control, ask what kind it is.■ Close the discussion by reinforcing the importance of doing a job hazard analysis to maintain a safe working environment.

4. Introduction to a Project Hazard Analysis Form: Demonstration

 5 minutes

Cues

What to Do or Say

Pages 14-15

- Refer employees to Pages 14 and 15.
- Tell them that this is a sample project hazard analysis form provided to the class by Orion, L.L.C.
- This is a good form to use when they begin a project at a wind farm and want to assess the hazards in the overall project.
- Review the Orion form by making the following points:
 - Section 1: Identifies the physical location of the job site.
 - Section 2: Identifies the people on the project, including whether or not they are trained in first aid/CPR.
 - Section 3: Identifies emergency procedures. This is important because it makes you think about how to evacuate a site in an emergency, or how to rescue a person in distress at height.
 - Section 4: The analysis of the tasks, their hazards and controls. It's an abbreviated version of the exercise we just did on Page 13.
 - Section 5: Lists a number of possible hazards you might encounter at a sight.
 - Section 6: Lists some possible controls you can use.
 - Section 7: Provides for an analysis of a job site where there is an excavation.
 - Section 8: Provides for an analysis of a job site where people will be working at heights.
 - Section 9: Is for supervisory signoffs.

- When you are finished reviewing this form, refer employees back to Section 5. Ask them how they can learn about whether a job site has a chemical or silica exposure.
- Get a few responses, then make the following points.
 - Whenever a chemical is shipped from a supplier, it must be accompanied by a Materials Safety Data Sheet (MSDS).
 - An MSDS is a form used to comply with OSHA’s Hazard Communication Standard.
 - The MSDS can help a person identify potential chemical hazards related to the substances they are using at the job site.
 - You can get more information about the MSDS on the *Tools and Resources* CD.
- Close the discussion by reminding employees that both job hazard analysis forms used in this module can be found on their *Tools and Resources* CD.

MODULE 3

RECOGNIZING AND CONTROLLING HAZARDS FROM WORKING AT HEIGHTS

Module Purpose:

The purpose of this module is to examine falls—the leading cause of fatalities at wind turbine sites. Emphasis will be placed on the proper use of fall protection, scaffolds, guarding and ladders. Employees will identify specific injury prevention strategies for falls and learn the OSHA regulations related to falls.

Objectives:

Upon completion of this module, employees will be able to:

- Analyze wind energy worksites for fall-related hazards.
- Identify best practices and important controls for preventing falls.
- Practice the proper use of fall protection gear.
- Recognize and use OSHA standards related to falls and fall protection.

Recommended Time: 65 minutes

Pages from Participant Booklet: 16-29

PowerPoints: 39-52

Additional Materials:

1. Have a copy of the OSHA 1926 Standard available for reference during the OSHA segment of this module (agenda item #4).
2. Have the video called *How to Properly Put on a Fall Arrest System* ready to go on your projector system **or** bring a set of the fall arrest gear your employees use when they climb the turbines. The video can be found on your *Tools and Resources CD* in the *Facilitator Materials* folder, then in the *Videos* folder, then in the *Classroom Videos* folder.
3. Optional climbing videos, which can be found in the folder mentioned in #2.

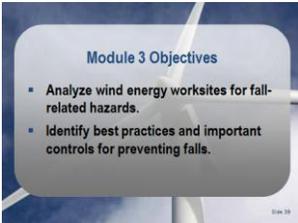
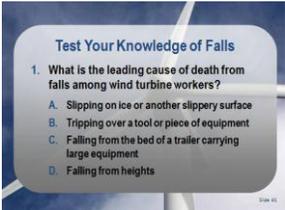
Recommended Agenda:

1. Test Your Knowledge of Falls—Quiz (10 minutes)
2. Worksite Analysis and Hazard Identification—Discussion and Activity (25 minutes)
3. Best Practices—Individual Activity and Demonstration(20 minutes)
4. Introduction to the OSHA Requirements—Presentation (10 minutes)

Module 3: Recommended Approach for Teaching

1. Test Your Knowledge of Falls: Quiz

 10 minutes

Cues	What to Do or Say
<p>Page 16</p> <p>PPT-39</p>  <p>Module 3 Objectives</p> <ul style="list-style-type: none">Analyze wind energy worksites for fall-related hazards.Identify best practices and important controls for preventing falls.	<ul style="list-style-type: none">Refer employees to Page 16. Tell them that this module will examine falls, which are the leading cause of fatalities at wind turbine sites.Use PPT-39 and PPT-40 to introduce objectives for Module 3.
<p>PPT-40</p>  <p>Module 3 Objectives—continued</p> <ul style="list-style-type: none">Practice the proper use of fall protection gear.Recognize and use OSHA standards relating to falls and fall protection.	
<p>Page 17</p>	<ul style="list-style-type: none">Refer employees to Page 17. Tell them they are now going to take a quiz to test how much they know about falls.Allow them a few minutes to answer the questions on the page.Review the quiz as a class discussion by doing the following.
<p>PPT-41 (animated)</p>  <p>Test Your Knowledge of Falls</p> <p>1. What is the leading cause of death from falls among wind turbine workers?</p> <ul style="list-style-type: none">A. Slipping on ice or another slippery surfaceB. Tripping over a tool or piece of equipmentC. Falling from the bed of a trailer carrying large equipmentD. Falling from heights	<ul style="list-style-type: none">Show PPT-41, which is quiz question #1, and ask employees how they answered.Get some responses, then advance the animation to give the correct answer, which is D.The leading cause of death from falls is falling from heights.

- Elaborate on this question by asking employees what can cause a fall from heights.
- Get their ideas, then add any of the following that aren't mentioned:
 - Loss of grip or balance caused by wind or other factors.
 - Icy conditions.
 - Objects falling from above.
 - Workers at different levels, where a person working above kicks or disturbs a person working below.
 - Lack of a platform for working.
 - Panic.
- Note: the source for this quiz question is <http://www.osha.gov/SLTC/etools/construction/falls/mainpage.html>.

PPT-42 (animated)

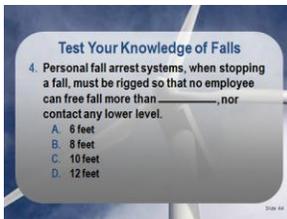


- Show PPT-42, which is question #2, and ask employees how they answered.
- Get some responses, then advance the animation to reveal the correct answer, which is C.
- Nearly a third of all construction deaths are caused by falls.
- Note: the source for this quiz question is <http://www.osha.gov/SLTC/etools/construction/falls/mainpage.html>.

PPT-43 (animated)



PPT-44 (animated)



- Show PPT-43, which is question #3, and ask employees how they answered.
 - Get some responses, then advance the animation to give the correct answer, which is C.
 - OSHA 1926.502(d)(9) describes the required strength of lanyards and vertical lifelines.
 - There should be a minimum breaking strength of 5,000 pounds.
-
- Show PPT-44 and ask employees how they answered.
 - Get some responses, then advance the animation to reveal the correct answer, which is A.
 - OSHA 1926.502(d)(16)(iii) provides the guideline for free falling distance, which is no more than 6 feet.

2. Worksite Analysis and Hazard identification: Discussion and Activity

 25 minutes

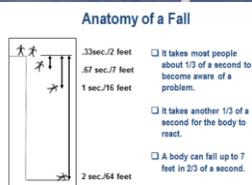
Cues

What to Do or Say

Facilitator Note

Page 18

PPT-45



- Allocate the time in the segment as follows:
 - About 5 minutes to review Page 18
- **Option 1**
 - About 20 minutes for a large group activity in which you identify the hazards on the pictures on Pages 19 through 23.
- **Option 2**
 - About 10 minutes for small groups to complete Page 24.
 - About 10 minutes to debrief the activity on Page 24 as a large class.
- Refer employees to Page 18. Tell them that you would like to introduce them to the anatomy of a fall.
- Show PPT-45 and point out that some people assume they can grab hold of something if they feel they are about to fall.
- But this chart illustrates just how unlikely it is that a person would be able to react in time.
- Review the points at the bottom of Page 18.

Option 1

Pages 19 through 23

Facilitator Note

Page 19

PPT-46



- Refer employees to Pages 19 through 23. Tell them that you are now going to do several mini job hazard analyses as a class.
- If you are short on time, or if some of the pictures in this activity do not apply to your group, select only two or three photos for this activity.
- Refer employees to Page 19.
- Show PPT-46, which is a picture of some employees working on top of the rebar of a foundation.
- Point out that we often don't think of rebar as containing fall hazards, but they do exist.
- Ask employees what potential fall hazards they face when they work on top of rebar.
- Each time an employee responds, ask what controls can either eliminate or lessen the impact of the hazard.
- Following are some responses you can expect (or share):
 - **Hazard:** Foot could get stuck in the space between the rebar.
 - **Control:** Build the rebar close enough together so that feet can't fall through.
 - **Hazard:** A person could trip on the rebar.
 - **Control:** Build a solid walking path for employees to use while walking from one part of the rebar to another.

Page 20

PPT-47



Page 21

PPT-48



- Refer employees to Page 20.
- Show PPT-47, which is a picture of some employees offloading tower parts with a crane.
- Ask them what potential fall hazards employees face when they are performing this task.
- Each time an employee responds, ask what controls can either eliminate or lessen the impact of the hazard.
- Following are some responses you can expect (or share):
 - **Hazard:** They could lose their balance and fall off of the truck.
 - **Control:** Have a spotter on the ground to watch the person working on the truck.
 - **Control:** Place a raised platform beside the truck so the working employee can't fall all the way to the ground.
- Refer employees to Page 21.
- Show PPT-48, which is a picture of an employee climbing a lattice tower.
- Ask them what potential fall hazards employees face when they are performing this task.
- Each time an employee responds, ask what controls can either eliminate or lessen the impact of the hazard.
- Following are some responses you can expect (or share):
 - **Hazard:** Employee could lose grip and fall.
 - **Hazard:** Employee could lose balance and fall
 - **Control:** Use fall arrest protection at all times

Page 22

PPT-49



Page 23

PPT-50



- Refer employees to Page 22.
- Show PPT-49, which is a picture of an employee on a nacelle platform getting ready to perform maintenance.
- Ask them what potential fall hazards employees face when they are performing this task.
- Each time an employee responds, ask what controls can either eliminate or lessen the impact of the hazard.
- Following are some responses you can expect (or share):
 - **Hazard:** Employee risks falling when transferring from the ladder to the platform.
 - **Control:** Make certain fall arrest system is attached at all times, especially during transfer.
- Refer employees to Page 23.
- Show PPT-50, which is a picture of two employees performing work at the joint of a monopole tower.
- Ask them what potential fall hazards employees face when they are performing this task.
- Each time an employee responds, ask what controls can either eliminate or lessen the impact of the hazard.
- Following are some responses you can expect (or share):
 - **Hazard:** Employee could lose footing and fall
 - **Hazard:** One employee could knock the other off balance
 - **Hazard:** Employee could lose balance.
 - **Control:** Fall arrest systems should be worn and attached to the tower at all times.

Option 2

Page 24

- Refer employees to Page 24. Break the class into small groups of 4 to 5 people.
- Tell them that this page lists typical work activities that occur at wind turbine sites that may have some intrinsic fall hazards.
- For each item, they should:
 - Identify the potential fall hazards.
 - Identify some controls that can protect workers from these hazards.
- Allow the group about 10 minutes to work.
- As they work, walk around the room to determine if they understand the assignment and if they have any questions.
- When time is up, call the group back together and facilitate a 10 minute debriefing, in which you do the following.
 - Get employee responses to each item, including both hazards and controls.
 - Learn which items are of the greatest concern for them at their worksites.
- Following are some potential answers you might receive.
- **Item 1**—Working when ground conditions are icy
 - **Hazard:** Employee could slip on ice.
 - **Control:** Salt or sand the icy area.
 - **Control:** Wear non-skid shoes or boots.
- **Item 2**—Walking on a rebar surface
 - **Hazard:** Foot could get stuck in space between the rebar.
 - **Control:** Build the rebar so that feet can't fall through.
 - **Hazard:** A person could trip on the rebar.
 - **Control:** Build a solid walking path for employees to use while walking from one part of the rebar to another.

- **Item 3**—Standing on a trailer while offloading turbine components.
 - **Hazard:** Workers could lose their balance and fall off of the truck.
 - **Control:** Have a spotter on the ground to watch the person working on the truck.
 - **Control:** Place a raised platform beside the truck so the working employee can't fall all the way to the ground.

- **Item 4**—Climbing a lattice or a monopole (freestanding) tower
 - **Hazard:** Employee could lose grip and fall.
 - **Hazard:** Employee could lose balance and fall.
 - **Control:** Use fall arrest protection at all times.

- **Item 5**—Transferring from tower to nacelle platform
 - **Hazard:** Employee could lose balance and fall.
 - **Hazard:** Employee could lose grip during reach.
 - **Control:** Make certain fall arrest system is attached at all times, especially during transfer.

- **Item 6**—Climbing inside the tower.
 - **Hazard:** Employee could lose grip and fall.
 - **Hazard:** Employee could lose balance and fall.
 - **Control:** Use fall arrest protection at all times.

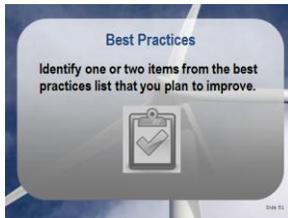
- **Item 7**—Attaching/bolting tower segments
 - **Hazard:** Employee could lose footing and fall.
 - **Hazard:** One employee could knock the other off balance.
 - **Hazard:** Employee could lose balance.
 - **Control:** Fall arrest systems should be worn and attached to the tower at all times.

- **Item 8**—Working in a man-lift basket
 - **Hazard:** If employee reaches too far, could lose balance and fall out of basket.
 - **Control:** Position basket to minimize employee reaching.
- **Item 9**—Attaching rotor blades to nacelle
 - **Hazard:** Employee could lose footing and fall.
 - **Hazard:** Employee could lose balance.
 - **Hazard:** Rotor blade could knock employee off balance.
 - **Control:** Fall arrest systems should be worn and attached to anchor points at all times.
 - **Control:** Rotor blade should be secured to minimize movement.
- **Item 10**—Working outside nacelle and transferring to the hub
 - **Hazard:** Employee could lose grip and fall.
 - **Hazard:** Employee could lose balance and fall.
 - **Control:** Fall arrest systems should be worn and attached to anchor points at all times.
- **Item 11**—Working inside nacelle
 - **Hazard:** Employee could trip on tools or other items on floor.
 - **Control:** Keep floor free of debris.

3. Best Practices: Individual Activity and Demonstration 20 minutes

Cues	What to Do or Say
Facilitator Note	<ul style="list-style-type: none">■ Allocate the time in the segment as follows:<ul style="list-style-type: none">– About 5 minutes for individuals to assess themselves on the items listed on Pages 25 and 26.– About 5 minutes for you to debrief the assessment with them.– About 5 minutes for the fall arrest system demonstration on Page 27 (either live or video).– About 5 minutes to cover the rescue plan on Page 28.
Pages 25 and 26	<ul style="list-style-type: none">■ Refer employees to the best practices assessment on Pages 25 and 26.■ Tell them that this assessment is derived from OSHA regulations related to falls, which they will be introduced to shortly.■ It is a list of practices that, if done consistently, can reduce the risk of falls at their worksites.■ Tell them that they have 5 minutes to assess themselves and their worksites on how well they practice the items on these two pages.■ They should assess themselves using the scale on Page 25.■ As employees work, walk around the room to see if there are questions.■ Call time periodically to keep employees on track.

PPT-51



Page 27

Fall Arrest System

Video

Both Options 1 and 2

- When time is up, bring the group back together and discuss the assessment by doing the following:
 - Ask which items they feel are done particularly well at their worksite.
 - Ask where they feel improvements can be made.
- Show PPT-51 as you have employees identify one or two items from the assessment that they would like to improve.
- Close this activity by encouraging employees to work on improving the items they have selected. When they do this, they will make their worksite safer from falls.
- Refer employees to Page 27. Tell them they will now get a demonstration that illustrates how to correctly put on fall arrest protection.
- You have two options for this demonstration:
 - **Option 1:** Bring in the fall arrest equipment you use at your wind tower sites and demonstrate with the actual equipment and an employee volunteer.
 - **Option 2:** Show the video called *How to Properly Put on a Fall Arrest System*. This video is silent, so you will need to narrate the key points.
- Include the following points when you narrate. If you are using your own fall arrest system, adjust these points as applicable.
 - This is a full-body harness.
 - It should be used when climbing towers with ladders, foot pegs (as on a monopole) and lattice style structures.
 - Harnesses are rated between 130-310 pounds. Your harness must be strong enough to support the weight of the person **plus** anything s/he brings along.
 - You see the people in the video putting on waistbands. Not all harnesses have waistbands, but they provide extra support.
 - There is a D-ring in the chest area. A steel cable attaches to this D-ring, enabling a person to climb hands free. The maximum free-fall distance with this system is two feet.

Page 28

PPT-52



Optional Videos

- Note that there are also two side D-rings at the waist. This is to allow employees to carry equipment without having to hold it.
- The leg straps distribute the weight.
- Notice the twin-arm lanyards. These lanyards get attached to anchor points using the large pelican clips.
- Note that anchor points must be rated to 5,000 pounds.
- At times, anchor points will be colored yellow and labeled.
- However, if you can't find a marked anchor point, and you must use your judgment, ask yourself if the anchor point you are about to use could support a full-sized truck. That is the equivalent of 5,000 pounds.
- Notice the draw-string pouches they are using. These are for carrying any necessary equipment (gloves, cell phones, radios, tools, camera, extra carabiners).
- The hard hats they are wearing are rated for both top and side impact. It is a best practice to use this type of hard hat.
- These men are checking each other's equipment. This is important so that you don't have a false connection (attached to hair or a hood). The partner ensures the snap hook is fully engaged and closed at the back D-ring.

- Refer employees to Page 28. Point out that no one ever intends to fall, but what would they do if suddenly they had a colleague suspended out of reach toward the top of the tower?
- It is important to have a rescue plan in place before a fall. This plan should be reviewed and practiced on a regular basis.
- Show PPT-52 as you review the important components of a rescue plan.
- There are videos on your *Tools and Resources* CD of people climbing a ladder, pegs, and climbing indoors. If you would like to show these videos, you will need to add time to the class.

4. Introduction to the OSHA Requirements: Presentation 🕒 10 minutes

Cues	What to Do or Say
Page 29	<ul style="list-style-type: none">■ Refer employees to Page 29. Tell them that OSHA has many regulations related to keeping employees safe from falls.■ Review the major OSHA 29 CFR 1926 subparts related to falls by saying the following:<ul style="list-style-type: none">– Subpart L addresses important safety standards for scaffolds.– Subpart M addresses the employer’s duty to have fall protection. It also provides the criteria for the various protection systems.– Subpart X addresses ladder safety standards.■ Have employees review Page 29, then tell them they will now look at some of the information from the actual OSHA standard.■ Ask employees to identify a standard from Page 29 that they would like to learn more about.
OSHA Standard	<ul style="list-style-type: none">■ Refer to the appropriate section of the OSHA standard and review what is written.■ Discuss with employees what the standard means and how they can implement it at their worksites.■ Repeat the above process until you run out of time, or until employees run out of questions.

MODULE 4

RECOGNIZING AND CONTROLLING ELECTRICAL HAZARDS

Module Purpose:

The purpose of this module is to provide employees with an opportunity to examine the hazards that cause the most frequent electrical injuries and the controls that can keep them safe from electrical injuries.

Objectives:

At the end of this module, employees will be able to:

- Analyze wind energy worksites for electrical hazards.
- Recognize the danger of arc flash and identify steps to reduce the danger.
- Identify best practices and important controls for preventing electrical injuries and fatalities.
- Practice the proper use of lockout/tagout.
- Recognize and use OSHA standards related to electrical safety.

Recommended Time: 65 minutes

Pages from Participant Booklet: 30-42

PowerPoints: 53-80

Additional Materials:

1. Have a copy of the OSHA 1926 Standard available for reference during the OSHA segment of this module (agenda item #4).
2. Have the video called *Arc Flash Explosion* ready to go on your projector system. The video can be found on your *Tools and Resources CD* in the *Facilitator Materials* folder, then in the *Videos* folder, then in the *Classroom Videos* folder.
3. If your company uses its own lockout/tagout procedures, bring copies of those procedures to class and plan to review your own procedures instead of those shown on Page 41.

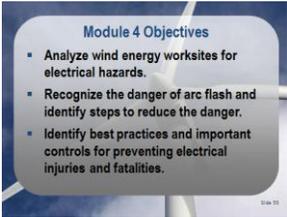
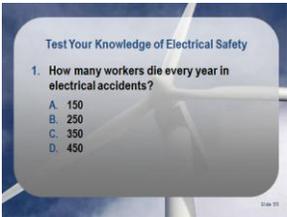
Recommended Agenda:

1. Test Your Knowledge of Electrical Safety—Quiz (10 minutes)
2. Worksite Analysis and Hazard Identification—Activity and Discussion (30 minutes)
3. Best Practices—Discussion and Individual Activity (15 minutes)
4. Introduction to the OSHA Requirements—Presentation (10 minutes)

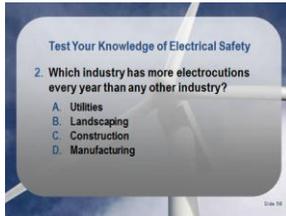
Module 4: Recommended Approach for Teaching

1. Test Your Knowledge of Electrical Safety: Quiz

 10 minutes

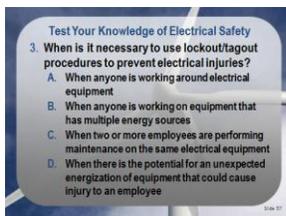
Cues	What to Do or Say
<p>Page 30</p> <p>PPT-53</p>  <ul style="list-style-type: none">Analyze wind energy worksites for electrical hazards.Recognize the danger of arc flash and identify steps to reduce the danger.Identify best practices and important controls for preventing electrical injuries and fatalities.	<ul style="list-style-type: none">Refer employees to Page 30. Tell them that this module will examine electrical safety.Use PPT-53 and PPT-54 to introduce objectives for Module 4.Point out that electrical hazards can affect <u>all</u> employees, not just the electricians.
<p>PPT-54</p>  <ul style="list-style-type: none">Practice the proper use of lockout/tagout.Recognize and use OSHA standards relating to electrical safety.	
<p>Page 31</p>	<ul style="list-style-type: none">Refer employees to Page 31. Tell them they are now going to take a quiz to test how much they know about electricity.Allow them a few minutes to answer the questions on the page.Review the quiz as a class discussion by doing the following.
<p>PPT-55 (animated)</p>  <p>1. How many workers die every year in electrical accidents?</p> <ul style="list-style-type: none">A. 150B. 250C. 350D. 450	<ul style="list-style-type: none">Show PPT-55, which is quiz question #1, and ask employees how they answered.Get some responses, then advance the animation to give the correct answer, which is C.Point out that this is the equivalent of almost one death from electrical injury every day!Note: the source for this quiz question is http://www.osha.gov/SLTC/etools/construction/electrical_incidents/mainpage.html.

PPT-56 (animated)



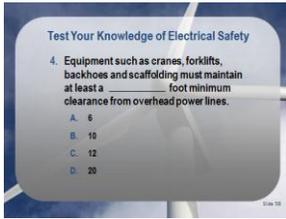
- Show PPT-56, which is quiz question #2, and ask employees how they answered.
- Get some responses, then advance the animation to give the correct answer, which is C. Emphasize that this statistic does apply to them because when they erect a wind turbine, they are doing construction.
- Ask employees: Why do you think the construction industry has so many more electrocutions than other industries?
- Get their responses. Some ideas that may come up are:
 - Construction workers are around electricity more than other workers and are therefore exposed to it more.
 - Construction workers are often working with electrical tools and equipment to do their jobs.
 - The purpose of erecting a turbine is to make electricity, so of course they will likely be exposed to it.
- Emphasize once again that ALL employees work around electricity. Therefore ALL employees need to practice electrical safety.
- Note: the source for this quiz question is the NIOSH publication titled *Worker Deaths by Electrocution*, page 14. You can find this publication on your *Tools and Resources* CD.

PPT-57 (animated)



- Show PPT-57, which is quiz question #3, and ask employees how they answered.
- Get some responses, then advance the animation to give the correct answer, which is D.
- OSHA 1910.147(a)(1)(i) describes when lockout/tagout should be used to prevent electrical injury.

PPT-58 (animated)



- Show PPT-58, which is quiz question #4, and ask employees how they answered.
- Get some responses, then advance the animation to reveal the correct answer, which is B.
- OSHA 1926.600(a)(6) the distance you should maintain when operating equipment around power lines.
- This distance is 10 feet.
- Tell employees that operating equipment around overhead power lines is extremely dangerous, so it is important to adhere to this regulation.

2. Worksite Analysis and Hazard identification: Activity and Discussion

 30 minutes

Cues

What to Do or Say

Facilitator Note

- Allocate the time in this segment as follows:
 - About 5 minutes for a large group discussion of Page 32.
 - About 5 minutes each to present the information on Pages 33-35
 - About 10 minutes to discuss the arc flash information on Pages 36 and 37, and to show the arc flash video.

Page 32

- Refer employees to Page 32.
- Tell them that this page lists a variety of electrical hazards that can be found at a worksite.
- Ask employees to look at these items and identify where at their worksites such a hazard might exist.
- Get employee responses, adding your own ideas as they are appropriate.
- As you go through these items, emphasize that as long as they are using and working around electricity, they will encounter electrical hazards and should be prepared to eliminate or control them.

Page 33

- Refer employees to the top of Page 33.
- Tell them that electricity is a funny thing. You can't see or taste it, but if you come into contact with it, it can do considerable harm.

PPT-59

- Show PPT-59 and discuss the effects on the human body of the various amperages.

Electrical Harm

Estimated Effects of AC Currents (U.S. Standard 60 Hz)	
1 millamp (mA)	Barely perceptible
16 mA	Maximum current an average man can grasp and "let go"
20 - 30 mA	Paralysis of respiratory muscles
100 mA	Ventricular fibrillation threshold
2 Amps	Cardiac standstill and internal organ damage
15/20/30 Amps	Common U.S. household breakers



PPT-60

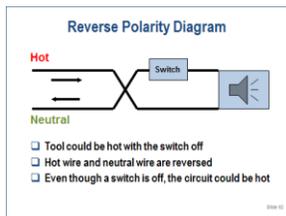


Page 34

PPT-61

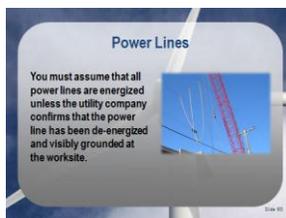


PPT-62



Page 35

PPT-63



- Refer employees to the bottom of Page 33.
- Show PPT-60 as you review the three points describing electrical damage to the body.
- Refer to the OSHA pictures at the bottom of the page to emphasize how violently electricity enters and exits the body.

- Refer employees to Page 34. Tell them that it is important to use a ground fault circuit interrupter (GFCI) with an open neutral protection at their worksites.

- Show PPT-61 as you describe how a ground fault circuit interrupter can protect them from electrical injury.

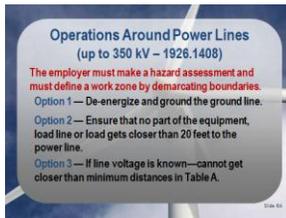
- Refer employees to the middle of Page 34. Demonstrate the importance of the GFCI by discussing reverse polarity.

- Show PPT-62 to provide an example of reverse polarity.

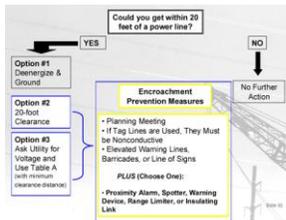
- Refer employees to Page 35. Tell them that another hazard they have to be on the lookout for at their wind sites is overhead power lines.

- Show PPT-63 as you explain to employees that they must assume that all power lines around them are energized unless the utility company confirms that the power line has been de-energized and visibly grounded at the worksite.

PPT-64

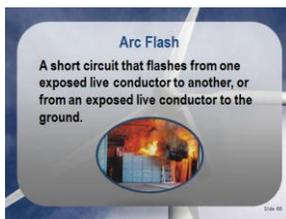


PPT-65



Page 36

PPT-66



PPT-67 (animated)



- Show PPT-64 and PPT-65 to discuss operations around power lines.

- Refer employees to Page 36. Another electrical hazard they must know about it arc flash.

- Show PPT-66 as you introduce the definition of arc flash.

- Ask employees if they have ever seen an arc flash. Get some responses. (Alternately, if there has even been an arc flash at one of your sites, you can discuss that incident.)

- Review the facts about arc flash in the middle of the page.

- Show PPT-67 as you review the facts about arc flash in the middle of the page.

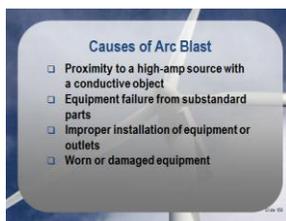
- This is an animated slide. As you review each arc flash fact, advance the slide for the accompanying visual effect.

Video

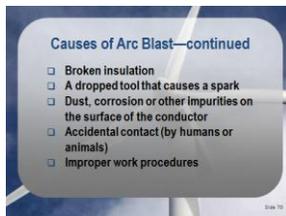
PPT-68



PPT-69



PPT-70

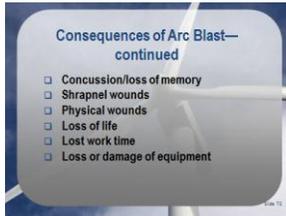


PPT-71



- To demonstrate the power of the arc flash, show the video called *Arc Flash Explosion*.
- Emphasize that this is a controlled blast, but it illustrates how powerful these explosions are.
- Show PPT-68 to review the areas where arc flash can occur.
- Ask employees which of these areas are of concern for them at their worksites.
- Get some responses.
- Show PPT-69 and PPT-70 to review the causes of arc blast.
- Ask employees if any of the items on these two slides has ever happened to them.
- Emphasize that it doesn't take much to create conditions that could create an arc flash.
- Show PPT-71 and PPT-72 to show the numerous bad consequences of getting caught in an arc blast.
- Emphasize that these consequences happen only to the lucky people who happen to survive.

PPT-72



Video

Page 37

PPT-73



- Refer employees to the bottom of Page 36 and review the things that can be done to prevent injury from arc flashes.
- Emphasize the importance of wearing fire-resistant clothing.
- To demonstrate how important fire-resistant clothing is, show the *Arc Flash Explosion* video one more time.
- At the end of the video, point out how the mannequin’s clothing has not completely burned up.
- The fire resistant clothing provided a small degree of protection against the powerful explosion.
- Refer employees to Page 37. Explain that fire-resistant clothing isn’t enough to protect employees who work in areas where arc flashes are possible.
- There also needs to be some limits of approach. The National Fire Protection Association (NFPA) has published NFPA 70E, which is a standard for electrical safety in the workplace.
- This standard identifies limits of approach for workers. These limits establish arc flash boundaries for working around energized parts.
- Show PPT-73 to introduce the four boundaries surrounding the energized part.

PPT-74



- Show PPT-74 to introduce the flash protection zone.
- This demarks the outer zone of flash protection.
- Employees working in this zone must wear flash protection equipment.

PPT-75



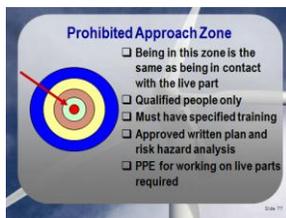
- Show PPT-75 to introduce the limited approach zone.
- Only qualified people can enter this zone.
- They must wear flash protective equipment.
- Unqualified workers are prohibited to be in this zone.

PPT-76



- Show PPT-76 to introduce the restricted approach zone.
- A person working in this zone is in restricted space.
- Only qualified workers are allowed in this zone.
- An approved written plan is required before a person can go into this zone.
- PPE is required at all times.
- The worker must keep as much of his/her body as possible out of this zone.
- Absolutely no body part can cross the line into the prohibited zone.

PPT-77



- Show PPT-77 to introduce the prohibited approach zone.
- Being in this zone is equal to being in contact with the live part.
- Only qualified people who have highly specialized training can be in this zone.
- There must be a risk hazard analysis and an approved written plan for working in this zone.
- PPE for working with live parts is required.
- Close this section by answering questions.

3. Best Practices: Discussion and Individual Activity



15 minutes

Cues	What to Do or Say
Facilitator Note	<ul style="list-style-type: none">■ Allocate the time in this segment as follows:<ul style="list-style-type: none">– About 5 minutes for individuals to assess themselves on the items listed on Pages 38 through 40.– About 5 minutes for you to debrief the assessment with them.– About 5 minutes to discuss the lockout/tagout information on Page 41.
Pages 38 through 40	<ul style="list-style-type: none">■ Refer employees to the best practices assessment on Pages 38 through 40.■ Tell them that this assessment is derived from OSHA regulations related to electricity safety.■ It is a list of practices that, if done consistently, can reduce or prevent electrical injuries at their worksites.■ Tell them that they will have 5 minutes to assess themselves and their worksites on how well they practice the items on these three pages.■ They should assess themselves using the scale on Page 38.■ As employees work, walk around the room to see if there are any questions.■ Call time periodically to keep employees on track.■ When time is up, bring the group back together and discuss the assessment by doing the following:

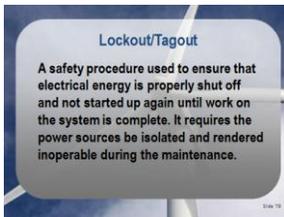
PPT-78



Facilitator Note

Page 41

PPT-79



PPT-80



- Ask which items they feel are done particularly well at their worksite.

- Ask where they feel improvements can be made.

- Show PPT-78 as you have employees identify one or two items from the assessment that they would like to improve.

- Close this activity by encouraging employees to work on improving the items they have selected.

- When they do this, they will make their worksite safer from electrical hazards.

- If you already have lockout/tagout procedures in your organization, bring copies of those procedures and review those versus the ones on Page 41.

- Refer employees to Page 41. Point out that one of the suggestions for best practices listed on the previous pages is lockout/tagout.

- Ask them to define lockout/tagout.

- Get some definitions, then show PPT-79, which provides the definition.

- Review the procedures for performing lockout/tagout on Page 41 (or review your company's own procedures).

- Show PPT-80 to illustrate a lockout device with multiple padlock locations and some examples of tags.

4. Introduction to the OSHA Requirements: Presentation 10 minutes

Cues	What to Do or Say
Page 42	<ul style="list-style-type: none">■ Refer employees to Page 42. Tell them OSHA has many regulations related to electrical safety on the job. Provide an overview of the regulations related to electrical safety.■ 29 CFR 1910.147 provides guidelines for using lockout/tagout.■ 29 CFR 1926 also includes electrical guidelines.<ul style="list-style-type: none">– Subpart I addresses standards for using power operated hand tools.– Subpart K addresses a variety of standards for electrical safety including use of electrical equipment, requirements for wiring design and general requirements for worker safety around electricity.– Subpart CC addresses standards for operating cranes and derricks around electrical lines.■ Tell employees that, in addition to OSHA regulations, two other organizations have developed standards that have relevance to electrical safety on wind turbines.<ul style="list-style-type: none">– The National Fire Protection Association (NFPA) has developed NFPA 70, a United States standard for the safe installation of electrical wiring and equipment.– The International Electrotechnical Commission (IEC) has developed IEC 61400-1, a standard for wind turbines.■ Have employees review Page 42, then ask them to identify a standard from Page 42 that they would like to learn more about.
OSHA Standard	<ul style="list-style-type: none">■ Refer to the appropriate section of the OSHA standard and review what is written.■ Discuss with employees what the standard means and how they can implement it at their worksites.■ Repeat until you run out of time.

MODULE 5

RECOGNIZING AND CONTROLLING EXCAVATION AND TRENCHING HAZARDS

Module Purpose:

This module will allow employees to examine safety issues related to excavations at wind turbine sites. Employees will be given a chance to perform a worksite analysis for excavations. They will be introduced to best practices to use in order to have safe excavations. Finally, they'll be introduced to the OSHA regulations that apply to safety at excavation sites.

Objectives:

Upon completion of this module, employees will be able to:

- Analyze their worksites for trenching and excavation hazards.
- Identify best practices and important controls for preventing trenching and excavation injuries.
- Recognize and use OSHA standards related to trenching and excavation.

Recommended Time: 65 minutes

Pages from Participant Booklet: 43-54

PowerPoints: 81-92

Additional Materials:

Have a copy of the OSHA 1926 Standard available for reference during the OSHA segment of this module (agenda item #4).

Recommended Agenda:

1. Test Your Knowledge of Excavations—Quiz (10 minutes)
2. Worksite Analysis for Excavation Hazards—Discussion (15 minutes)
3. Best Practices—Individual Activity and Discussion (30 minutes)
4. Introduction to the OSHA Requirements—Presentation (10 minutes)

Module 5: Recommended Approach for Teaching

1. Test Your Knowledge of Excavations: Quiz

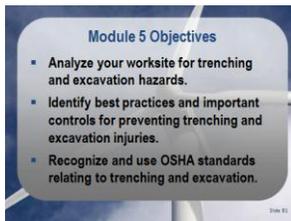
 10 minutes

Cues

What to Do or Say

Page 43

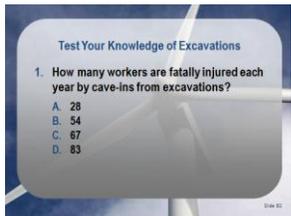
PPT-81



- Refer employees to Page 43. Tell them that this module will examine excavation and trenching safety.
- Use PPT-81 to introduce objectives for Module 5.

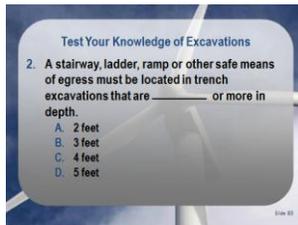
Page 44

PPT-82 (animated)

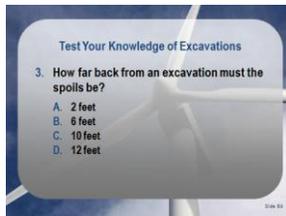


- Refer employees to Page 44. Tell them they are now going to take a quiz to test how much they know about excavations.
- Allow them a few minutes to answer the questions on the page.
- Review the quiz as a class discussion by doing the following.
- Show PPT-82, which is quiz question #1, and ask employees how they answered.
- Get some responses, then advance the animation to reveal the correct answer, which is B.
- Tell employees that this is over one fatality a week.
- Point out that cave-ins are a very serious problem at construction sites so it is important to examine how employees can work more safely around excavations.
- Note: the source for this quiz question is <http://cdc.gov/niosh/topics/trenching/>.

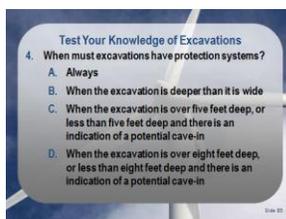
PPT-83 (animated)



PPT-84 (animated)



PPT-85 (animated)



- Show PPT-83, which is quiz question #2, and ask employees how they answered.
- Get some responses, then advance the animation to give the correct answer, which is C.
- OSHA 1926.651(c)(2) describes entry into and exit from excavations.
- If an excavation is 4 feet deep or more, it must have a ladder, ramp or stairway.
- Show PPT-84, which is quiz question #3, and ask employees how they answered.
- Get some responses, then give the correct answer, which is A.
- OSHA 1926.651(j)(2) provides this information.
- Ask employees what can be done if there isn't room to put the spoils 2 feet back.
- Acknowledge the employee who gets the correct answer, which is that a retention system has to be built around the site to retain the spoils.
- Ask employees what should be done if it is not possible to build a retention system.
- Again, acknowledge the employee who gets the correct answer, which is that the spoils would have to be hauled away to another location.
- Show PPT-85, which is quiz question #4, and ask employees how they answered.
- Get some responses, then give the correct answer, which is C.
- OSHA 1926.651 Subpart P gives the guidelines for when excavations should have protection systems.

2. Worksite Analysis for Excavation Hazards: Discussion 15 minutes

Cues	What to Do or Say
Page 45	<ul style="list-style-type: none">■ Refer employees to Page 45.■ Tell them that this is a list of typical work activities that occur at wind turbine sites when there is excavation for foundations.■ Ask employees to look at this list and note the work processes that apply now (or have applied in the past) to their worksites:■ Ask employees to share which processes apply to them.■ As they share ask them the following:<ul style="list-style-type: none">– What are the potential hazards for this activity?– What are some controls for these hazards?■ Allow employees to lead this activity with their questions and comments.■ Following are some possible hazards and controls for the activities on this page.■ Item 1—Digging a site for a wind turbine<ul style="list-style-type: none">– Hazard: Possible cave-in– Control: Make sure soil is tested– Control: Place the spoils back the appropriate distance– Hazard: Possibility of hitting underground electricity– Control: Check underground power lines before working■ Item 2—Performing foundation work inside of a trench<ul style="list-style-type: none">– Hazard: Possible cave in– Control: Make sure trench is properly supported– Hazard: Potential to be struck by concrete truck– Control: Have a worker direct truck traffic away from workers– Control: Maintain worker awareness of truck

- **Item 3**—Installing rebar in the excavation cavity
 - **Hazard:** Possible cave-in
 - **Control:** Ensure that rebar work doesn't disturb structural integrity of the trench
- **Item 4**—Entering or exiting an excavated site
 - **Hazard:** Possible fall
 - **Control:** Provide a ladder or properly sloped entry/exit
- **Item 5**—Transferring equipment and materials to and from trench
 - **Hazard:** Truck too close to edge could fall in
 - **Control:** Maintain and mark boundaries around the trench
 - **Hazard:** Weight of truck could cause cave-in
 - **Control:** In marking boundaries, make sure permissible zone can handle truck weight
- **Item 6**—Walking on a rebar surface in the trench
 - **Hazard:** Can trip or stumble on rebar
 - **Control:** Install rebar to accommodate the size of a foot
 - **Control:** Place a smooth walkway over the rebar for workers to use
- **Item 7**—Crossing over an excavated site on a walkway
 - **Hazard:** Fall hazard
 - **Control:** Maintain guardrails on the walkway
 - **Hazard:** Dropping items from overhead
 - **Control:** Wear hard hats
 - **Control:** Avoid working under the walkway
- **Item 8**—Walking near the edge of an excavation
 - **Hazard:** Fall hazard
 - **Control:** Establish boundaries around the excavation

- **Item 9**—Operating a vehicle around an excavated site
 - **Hazard:** Truck too close to edge could fall in
 - **Control:** Maintain and mark boundaries around the trench
 - **Hazard:** Weight of truck could cause cave-in
 - **Control:** In marking boundaries, make sure permissible zone can handle truck weight
- **Item 10**—Working in an excavated area during a storm
 - **Hazard:** Flash flooding into the trench
 - **Control:** Evacuate the trench immediately
 - **Hazard:** Soil made unstable by storm could cave-in
 - **Control:** Test soil before re-entering the trench
- Following are some other key points that should come out of the discussion.
 - Even if your business isn't doing the actual excavation, it can still be held liable for the negligence of a contractor.
 - It is important to negotiate safety criteria into the contract
 - It is also important to monitor the work of the contractor to ensure they are working according to contract.
 - A company should not hesitate to ask a contractor to redo work that does meet safety standards.

3. Best Practices: Individual Activity and Discussion

 30 minutes

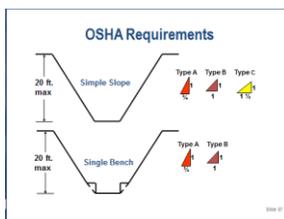
Cues	What to Do or Say
Facilitator Note	<ul style="list-style-type: none">■ Allocate the time in this segment as follows:<ul style="list-style-type: none">– About 5 minutes for individuals to assess themselves on the items listed on Pages 46 and 47.– About 10 minutes to debrief the assessment with them.– Allow 5 minutes for a discussion of protection systems on Page 48.– About 10 minutes for the best practices analysis of photos.
Pages 46 and 47	<ul style="list-style-type: none">■ Refer employees to the best practices assessment on Pages 46 and 47.■ Tell them that this assessment is derived from OSHA regulations related to excavations.■ It is a list of practices that, if done consistently, can reduce the risk of excavation-related injuries at their worksites.■ Tell them that they will have 5 minutes to assess themselves and their worksites on how well they practice the items on these three pages.■ They should assess themselves using the scale on Page 46.■ As employees work, walk around the room to see if there are any questions.■ Call time periodically to keep employees on track.■ When time is up, bring the group back together and discuss the assessment by doing the following:

PPT-86



Page 48

PPT-87



Facilitator Note

- Ask which items they feel are done particularly well at their worksite.

- Ask where they feel improvements can be made.

- Show PPT-86 as you have employees identify one or two items from the assessment that they would like to improve.

- Close this activity by encouraging employees to work on improving the items they have selected.

- When they do this, they will make their worksite safer from excavation-related injuries.

- Refer employees to Pages 48. Use this page to give them a brief introduction of protection systems.

- Make the following points:

- It is important to determine the type of soil that exists where your wind turbine will be erected.

- A key question to ask is, “Are we creating a hole that can be sustained by the soil?”

- The competent person in the excavation company that you hire should perform a soil test.

- Show PPT-87 as you explain a simple slope protection system and a single bench protection system.

- Answer questions as employees have them.

- For the following activity, if you are short on time, or if some of the pictures in this activity do not apply to your group, select only two or three photos for this activity.

Pages 49 through 53

PPT-88



- Refer employees to Pages 49 through 53. Tell them that these are five photos of excavation sites.
- Ask them to look at each photo and, using the best practices they've just reviewed, identify the best practices being used at these sites.
- While they're at it, have them identify any hazards they see as well.
- Refer employees to Page 49. Show PPT-88 and get employee ideas on the best practices in the photo. Some responses you might get are:
 - A wide entry/egress ramp.
 - Earthen ramp is level.
 - Spoils set far back from the excavation.
 - Step protection system.
 - No water is present.
 - The spoils serve as a natural barricade.
 - Excavated area is free of debris.
- Now get some ideas for hazards. Some responses you might get are:
 - This is a pretty clean site.
 - There may be a hazard if a downpour were to cause a sliding of the spoils pile, but this is a pretty big excavation, and the spoils pile is set pretty far back from a bench, so it's reasonably safe.
 - The competent person in the excavation company that you hire should perform a soil test after a storm.

PPT-89



- Refer employees to Page 50. Show PPT-89 and get employee ideas on the best practices in the photo. Some responses you might get are:
 - A wide entry/egress ramp.
 - Earthen ramp is level.
 - Spoils set far back from the excavation.
 - Step protection system.
 - No water is present.
 - The spoils serve as a natural barricade.
 - Excavated area is free of debris.
 - Workers are wearing hard hats.
 - Workers are wearing protective gear.
 - Vehicles are set far back from the edge of the excavation.
- Now get some ideas for hazards. Some responses you might get are:
 - This is a pretty clean site.
 - There may be a hazard if a downpour were to cause a sliding of the spoils pile.
 - There are also no barricades marking the closest to the edge a vehicle can come.

PPT-90



- Refer employees to Page 51. Show PPT-90 and get employee ideas on the best practices in the photo. Some responses you might get are:
 - The spoils are set back appropriately.
 - There is a visible bench.
 - Excavated area is free of debris.
- Now get some ideas for hazards. Some responses you might get are:
 - It is not clear from the picture where the entry/egress ramp is. To be safe, there would have to be a bridge over the water.
 - A flash flood could potentially cover the bridge, trapping the workers on the foundation.

PPT-91



- Refer employees to Page 52. Show PPT-91 and get employee ideas on the best practices in the photo. Some responses you might get are:
 - Spoils set far back from the excavation.
 - Entry/egress ramp is wide enough and adequately sloped.
 - No water is present.
- Now get some ideas for hazards. Some responses you might get are:
 - There is quite a bit of debris around this site.
 - It is unclear if the ground is level/stable enough to support the ladder.

PPT-92



- Refer employees to Page 53. Show PPT-92 and acknowledge that the shadow makes it difficult to see the entire excavation. In spite of that, get employee ideas on the best practices in the photo. Some responses you might get are:
 - A wide entry/egress ramp.
 - The spoils on the right are set far back from the excavation.
- Now get some ideas for hazards. Some responses you might get are:
 - There is quite a bit of debris around the site.
 - The ramp appears to be muddy and appears to have equipment tracks. Possible danger of equipment getting stuck in the mud.
 - Although the shadow makes it difficult to see, it appears that the spoils on the left are too close to the excavation.
- Close the discussion by encouraging employees to maintain excavations in a clean and safe manner.

4. Introduction to the OSHA Requirements: Presentation 10 minutes

Cues	What to Do or Say
Pages 54	<ul style="list-style-type: none">■ Refer employees to Page 54. Tell them that OSHA has many regulations related to excavation safety.■ Review the major OSHA 29 CFR 1926 subparts related to excavations by saying the following:<ul style="list-style-type: none">– Subpart D addresses environmental concerns at excavations.– Subpart E addresses protective and lifesaving equipment.– Subpart P addresses worker safety at excavations.■ Have employees review Page 54, then tell them they will now look at some of the information from the actual OSHA standard.■ Ask employees to identify a standard from Page 54 that they would like to learn more about.
OSHA Standard	<ul style="list-style-type: none">■ Refer to the appropriate section of the OSHA standard and review what is written.■ Discuss with employees what the standard means and how they can implement it at their worksites.■ Repeat the above process until you run out of time, or until employees run out of questions.

MODULE 6

RECOGNIZING AND CONTROLLING STRUCK-BY HAZARDS

Module Purpose:

In this module, employees will learn about the hazards that cause them to be struck by objects. Emphasis will be placed on struck-by injuries caused by vehicles, suspended objects and objects falling from above. Employees will learn how to protect themselves with appropriate work practices and the use of PPE.

Objectives:

Upon completion of this module, employees will be able to:

- Analyze their worksites for struck-by hazards.
- Identify best practices and important controls for struck-by injuries.
- Recognize and use OSHA standards related to the prevention of struck-by injuries.

Recommended Time: 65 minutes

Pages from Participant Booklet: 55-67

PowerPoints: 93-103

Additional Materials:

1. Have a copy of the OSHA 1926 Standard available for reference during the OSHA segment of this module (agenda item #4).
2. Have the video called *Struck By* ready to go on your projector system **or** bring a set of the fall arrest gear your employees use when they climb the turbines. The video can be found on your *Tools and Resources CD* in the *Facilitator Materials* folder, then in the *Videos* folder, then in the *Classroom Videos* folder.
3. If your company uses its own hand signals for communicating at worksites, bring copies of those signals to class and review them instead of those shown on Pages 63 and 64.

Recommended Agenda:

1. Test Your Knowledge of Struck-By Injuries—Quiz (10 minutes)
2. Worksite Analysis and Hazard Identification—Discussion and Activity (20 minutes)
3. Best Practices—Individual Activity and Discussion (25 minutes)
4. Introduction to the OSHA Requirements—Presentation (10 minutes)

Module 6: Recommended Approach for Teaching

1. Test Your Knowledge of Struck-By Injuries: Quiz

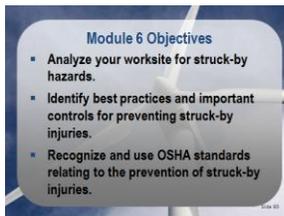
 10 minutes

Cues

What to Do or Say

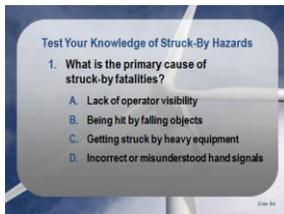
Page 55

PPT-93



Page 56

PPT-94, (animated)

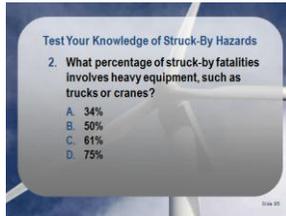


- Refer employees to Page 55. Tell them that this module will address safety practices that can reduce struck-by injuries.
- Use PPT-93 to introduce objectives for Module 6.

- Refer employees to Page 56. Tell them they are now going to take a quiz to test how much they know about struck-by injuries and regulations.
- Allow them a few minutes to answer the questions on the page.
- Review the quiz as a class discussion by doing the following.

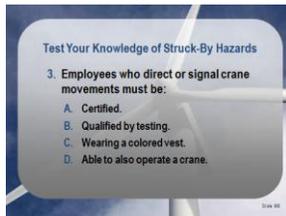
- Show PPT-94, which is quiz question #1, and ask employees how they answered.
- Get some responses, then give the correct answer, which is C.
- Point out that even though all of the items on this quiz question are factors in struck-by accidents, getting hit by heavy equipment is the most common.
- Note: the source for this quiz question is <http://www.osha.gov/SLTC/etools/construction/struckby/mainpage.html>.

PPT-95 (animated)



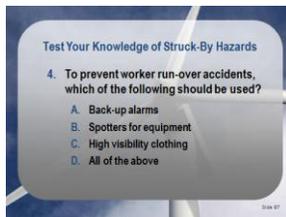
- Show PPT-95, which is quiz question #2, and ask employees how they answered.
- Get some responses, then give the correct answer, which is D.
- According to OSHA, getting struck by heavy equipment, such as trucks or cranes, is the cause of this extremely high percentage of fatalities.
- Note: the source for this quiz question is <http://www.osha.gov/SLTC/etools/construction/struckby/mainpage.html>.

PPT-96 (animated)



- Show PPT-96, which is quiz question #3, and ask employees how they answered.
- Get some responses, then give the correct answer, which is B.
- OSHA 1926.1428 provides the qualifications for signaling crane movements.

PPT-97 (animated)



- Show PPT-97, which is quiz question #4, and ask employees how they answered.
- Get some responses, then give the correct answer, which is D.
- OSHA 1926.602(a)(9) describes what can be done to prevent worker run-over accidents.

2. Worksite Analysis and Hazard identification: Discussion and Activity

 20 minutes

Cues	What to Do or Say
Facilitator Note	<ul style="list-style-type: none">■ Allocate the time in the segment as follows:<ul style="list-style-type: none">– About 10 minutes to discuss Page 57 as a class.– About 10 minutes to review the pictures on Pages 58 through 60 and get some responses as a class, and to review the <i>Struck By</i> short video.
Page 57	<ul style="list-style-type: none">■ Refer employees to Page 57.■ Tell them that this page lists typical work activities that occur at wind turbine sites that may have some intrinsic struck-by hazards.■ Lead a discussion in which you ask the group to:<ul style="list-style-type: none">– Identify the potential struck-by hazards.– Identify some controls that can protect workers from these hazards.■ Following are some answers you might get.■ Item 1—Movement of pedestrians and vehicles in the same area<ul style="list-style-type: none">– Hazard: Person could get hit by vehicle– Control: Establish pedestrian zones– Hazard: Two vehicles could collide– Control: Have an individual on the ground directing traffic.■ Item 2—Loading and unloading of vehicles<ul style="list-style-type: none">– Hazard: Possible item falling off of truck– Control: Make sure items on truck are firmly secured.

- **Item 3**—Moving and staging of large pieces of equipment
 - **Hazard:** Person could get in way of equipment
 - **Control:** Be alert to equipment movement
 - **Control:** Wear a hard hat at all times
- **Item 4**—Mechanical assembly of large components
 - **Hazard:** Pinch points
 - **Control:** Keep hands far away from equipment pieces as they are moving
 - **Hazard:** Potential for dropped tools
 - **Control:** If working above others, secure tools to a work belt or work on a platform with guards.
- **Item 5**—Overhead lifting of large components
 - **Hazard:** Potential for equipment to break free
 - **Control:** Avoid standing or working directly under the load
 - **Hazard:** Potential for equipment to swing around and hit a worker
 - **Control:** Use secondary crane or other piece of equipment to secure the piece from moving at random.
- **Item 6**—Guiding suspended pieces of equipment into place
 - **Hazard:** Potential for equipment to break free
 - **Control:** Avoid standing or working directly under the load
 - **Hazard:** Potential for equipment to swing around and hit a worker
 - **Control:** Use secondary crane or other piece of equipment to secure the piece from moving drastically
- **Item 7**—Falling objects from overhead
 - **Hazard:** Worker might drop tool
 - **Control:** Avoid working directly under someone who is working at height

Facilitator Note

Pages 58 through 60

Page 58

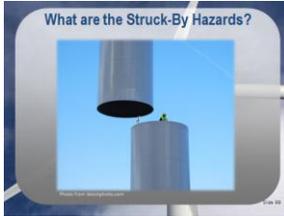
PPT-98



- **Item 8**—Crane, derrick, forklift, skid loader or hoist operation
 - **Hazard:** Possible tipover
 - **Control:** Avoid overloading or improperly loading equipment
 - **Hazard:** Item could fall off of equipment
 - **Control:** Properly load and secure everything to the equipment.
- **Item 9**—Locking out of blades before maintenance work begins
 - **Hazard:** Even though blade is shut down, it could be moved by a wind gust and knock a worker off balance.
 - **Control:** Wear a hard hat. Treat a locked-out blade as you would any other large piece of equipment that has the potential to move.
- For the following activity, select Page 58 if your employees primarily work on small wind turbines, and select Page 59 if they work on large turbines. Select page 60 regardless of turbine size.
- Refer employees to Pages 58 through 60. Tell them that they are now going to do a mini job hazard analysis as a class.
- Refer employees to Page 58, which contains a picture of a crane lifting a tower section into place.
- Show PPT-98 and ask employees what potential struck-by hazards workers face when they are performing this task.
- Each time an employee responds, ask what controls can either eliminate or lessen the impact of the hazard.
- Following are some responses you can expect (or share):
 - **Hazard:** Employee could get struck by the moving tower part.
 - **Control:** Secure tower section with supplemental crane.
 - **Control:** Employee needs to maintain strong awareness of position of tower section.

Page 59

PPT-99



Page 60

PPT-100



- Refer employees to Page 59, which contains a picture of a crane lifting a tower section into place.
- Show PPT-99, which is a picture of two tower sections being connected.
- Ask employees what potential struck-by hazards workers face when they are performing this task.
- Each time an employee responds, ask what controls can either eliminate or lessen the impact of the hazard.
 - **Hazard:** Employee could get struck by the moving tower part.
 - **Control:** Secure tower section with supplemental crane.
 - **Control:** Employee should use rope or other line to guide tower section from within the turbine so that his upper torso is not vulnerable to being hit by the tower section.
- Refer employees to Page 60.
- Show PPT-100, which is a picture of a crane raising a rotor to attach to the nacelle.
- Ask them what potential struck-by hazards employees face when they are performing this task.
- Each time an employee responds, ask what controls can either eliminate or lessen the impact of the hazard.
- Following are some responses you can expect (or share):
 - **Hazard:** Employee could get struck by rotor.
 - **Control:** Use supplemental crane to secure rotor (this is being done in the photo).
 - **Hazard:** Crane could topple
 - **Control:** Ensure foundation is solid and crane is properly loaded and secured.
 - **Hazard:** Rotor could get separated from the line suspending it.
 - **Control:** Ensure rotor is properly clipped on and the halyards are in top condition.

Video

- Close this section by showing the video called *Struck By*.
- Point out that this video shows how easy it is to make a decision in the moment that could put employees in peril for a struck-by accident.
- Both employees have made a mistake. What are these mistakes?
- Get employee ideas. They will probably quickly understand both mistakes.
 - **Employee descending ladder:** Failed to secure his pelican clip, so that it dangles and swings as he climbs down the ladder.
 - **Employee under ladder:** Failed to check ladder to make certain it was free of hazard.

3. Best Practices: Individual Activity and Discussion

 25 minutes

Cues	What to Do or Say
Facilitator Note	<ul style="list-style-type: none">■ Allocate the time in this segment as follows:<ul style="list-style-type: none">– About 10 minutes for individuals to assess themselves on the items listed on Pages 61 and 62.– About 5 minutes to debrief the assessment with them.– About 5 minutes to review the hand signals on Pages 63 and 64– About 5 minutes for the best practices analysis of photos on Pages 65 and 66.
Pages 61 and 62	<ul style="list-style-type: none">■ Refer employees to the best practices assessment on Pages 61 and 62.■ Tell them that this assessment is derived from OSHA regulations related to struck-by hazards.■ It is a list of practices that, if done consistently, can reduce the risk of struck-by injuries at their worksites.■ Tell them that they will have 10 minutes to assess themselves and their worksites on how well they practice the items on these three pages.■ They should assess themselves using the scale on Page 61.■ As employees work, walk around the room to see if there are any questions.■ Call time periodically to keep employees on track.■ When time is up, bring the group back together and discuss the assessment by doing the following:

PPT-101



Pages 63 and 64

Pages 65 and 66

- Ask which items they feel are done particularly well at their worksite.
- Ask where they feel improvements can be made.
- Show PPT-101 as you have employees identify one or two items from the assessment that they would like to improve.
- Close this activity by encouraging employees to work on improving the items they have selected.
- When they do this, they will make their worksite safer from struck-by injuries.
- Refer employees to Pages 63 and 64. Tell them that these drawings are from OSHA regulations for crane and derrick safety.
- If your organization has its own set of signals, ask employees to compare the OSHA signals with those used in your organization.
- Select two or three signals and do the following.
 - If your organization has its own set of hand signals, review the most important signals for your site.
 - If your organization does not have its own set of hand signals, pick a few from Pages 63 and 64, and ask for volunteers to stand up and demonstrate your organization's signal for the stated warning.
- Refer employees to Pages 65 and 66. Tell them that these are two photos of wind construction sites that they will now assess for best practices.
- Ask them to look at each photo and, using the best practices list they've just reviewed, identify the best practices being used at these sites.

PPT-102



- Show PPT-102 and get employee ideas on the best practices in the photo. Some responses you might get are:
 - Workers are wearing hard hats.
 - Rotors are secured by supplemental cranes to prevent turning while raising.

PPT-103



- Show PPT-103 and get employee ideas on the best practices in the photo. Some responses you might get are:
 - This photo is an excellent example of good housekeeping.
 - There is a separate area for storage.
 - Area is organized.
 - Equipment is stored away from actual wind turbines to prevent excess clutter at sites.
 - You can't tell by looking at the visual, but there is even a separate lunch car for employees so they don't have to drive great distances for lunch.
- Close the discussion by encouraging employees to maintain outstanding struck-by practices at their sites.

4. Introduction to the OSHA Requirements: Presentation 10 minutes

Cues	What to Do or Say
Pages 67	<ul style="list-style-type: none">■ Refer employees to Page 67. Tell them that OSHA has many regulations related to struck-by safety.■ Review the major OSHA 29 CFR 1926 subparts related to struck-by.<ul style="list-style-type: none">– Subpart E addresses protective and lifesaving equipment.– Subpart G addresses important signs, signals and banners.– Subpart L addresses standards for scaffolding.– Subpart O addresses the safe use of motor vehicles and mechanized equipment.■ Have employees review Page 67, then tell them they will now look at some of the information from the actual OSHA standard.■ Ask employees to identify a standard from Page 67 that they would like to learn more about.
OSHA Standard	<ul style="list-style-type: none">■ Refer to the appropriate section of the OSHA standard and review what is written.■ Discuss with employees what the standard means and how they can implement it at their worksites.■ Repeat the above process until you run out of time, or until employees run out of questions.

MODULE 7

RECOGNIZING AND CONTROLLING HAZARDS FROM EXPOSED ENVIRONMENTS

Module Purpose:

In this module, employees will examine the hazards related to working in an exposed environment. They will examine factors that can affect the body's natural ability to balance its temperature. They will learn how to recognize heat and cold stress, and they'll identify methods for protecting themselves in extreme weather conditions.

Objectives:

Upon completion of this module, employees will be able to:

- Explain the factors that affect thermal balance.
- Recognize the signs of heat stress.
- Recognize the signs of cold stress.
- Recognize other potential hazards from working in an outside environment.
- Identify best practices and important controls for keeping safe while working outside.
- Identify obstacles to using safe practices at their worksites.
- Identify the resources available on their *Tools and Resources* CD.

Recommended Time: 50 minutes

Pages from Participant Booklet: 68-75

PowerPoints: 104-113

Additional Materials:

- One post-course test for each participant
- One course evaluation for each participant

Recommended Agenda:

1. Hazards of Working in an Outdoor Environment—Presentation and Discussion (10 minutes)
2. Best Practices—Discussion (5 minutes)
3. Obstacles to Using Safe Practices at Your Worksite—Activity (10 minutes)
4. Post-Course Test—Individual Activity (20 minutes)
5. Course Evaluation—Individual Activity (5 minutes)

Module 7: Recommended Approach for Teaching

1. Hazards of Working in an Outdoor Environment: Presentation and Discussion

 10 minutes

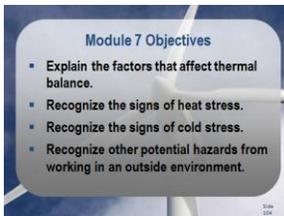
Cues

What to Do or Say

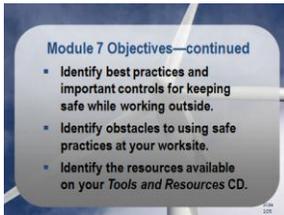
Facilitator Note

Page 68

PPT-104

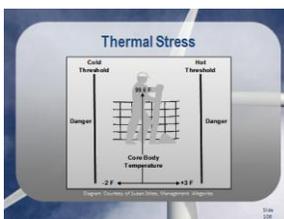


PPT-105



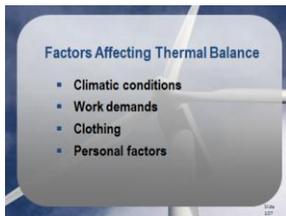
Page 69

PPT-106



- Allocate the time in this segment as follows:
 - About 1 minute to present the objectives on Page 68.
 - About 3 minutes each to discuss Page 69, 70 and 71.
- Refer employees to Page 68. Tell them that this module will address the hazards associated with working in an exposed environment—whether it’s hot, cold, extreme storms or exposure to insects and plants.
- Introduce Module 7 objectives with PPT-104 and PPT-105.
- Refer employees to Page 69.
- Introduce thermal stress by saying it occurs when a person’s environment is either extremely hot or extremely cold.
- Show PPT-106 and make the following points:
 - A person can comfortably operate within a few degrees of core body temperature.
 - However, once temperatures become extreme in either direction, the body begins to react.

PPT-107



Page 70

PPT-108



- **Note:** If anyone asks about the core body temperature being 99.6° rather than 98.6°, explain that thermometers are used in the outer extremities of the body, where the temperature has cooled down. In its core, body temperature is a degree higher than in the mouth.
- Refer employees to the chart at the bottom of Page 69 and explain that there are several factors that can affect a body's thermal balance.
- Show PPT-107 as you review the factors that can affect a body's thermal balance.
- Review by discussing the following with employees.
 - What are some of the typical weather extremes we deal with at our work sites?
 - How effective are we at adjusting our work demands to the climatic conditions?
 - Do you find that some of the personal factors affect your ability to function in extreme weather conditions?
- Refer employees to Page 70. Tell them that it is important to recognize when they or their co-workers are showing signs of either heat or cold stress.
- Show PPT-108 as you ask employees to identify the signs of heat and cold stress. Following are some answers you can expect.
 - Heat stress
 - Headache
 - Dizziness
 - Weakness and fainting
 - Wet skin
 - Irritability
 - Confusion

- Thirst
- Nausea and vomiting
- Cold stress
 - Shivering
 - Fatigue
 - Loss of coordination
 - Confusion and disorientation
 - Blue skin
 - Dilated pupils
 - Slowed pulse and breathing
 - Loss of consciousness
- Close the discussion by reminding employees of the importance of recognizing these signs and acting quickly.
- Refer employees to Page 71. Tell them when they are working outdoors, heat and cold aren't the only things they have to be concerned about.
- This page lists a variety of outdoor hazards.
- Have employees look at this list and identify those things that they commonly encounter at their worksites.
- Get a few responses, then ask employees how to control these hazards.
- Following is a list of some of the responses you might get.
 - **Sunburn:** Wear sun block, cover up arms, legs, torso, wear a hat
 - **Tornados:** Listen to and heed forecasts, have a safe shelter, evacuate upon warnings
 - **Lightning:** Listen to and heed forecasts, have a safe shelter, evacuate upon first sign of lightening
 - **Windstorms:** Know your maximum limit before evacuating, secure tools and equipment that could get blown over

- **Hurricanes:** Listen to and heed warnings, evacuate before situation becomes dire
- **Bees:** Know if you are allergic, avoid bright colored clothing, avoid scented deodorants, hair sprays, colognes
- **Snakes:** Be aware of your environment, know how to treat a snake bite, look before reaching into boxes or enclosures or before stepping into an area where you can't see the ground
- **Spiders:** Know if you are allergic, be aware of your environment, know how to treat spider bites
- **Ticks:** Know your environment, avoid tall grasses and shrubs, wear clothing to cover as much of your body as possible, if you are in tall grasses and shrubs, check yourself closely
- **Mosquitoes:** Wear insect repellent, avoid bright colored clothing, avoid scented deodorants, hair sprays, colognes, know how to treat mosquito bites
- **Scorpions:** Know if you are allergic, look before reaching into boxes or enclosures, know how to treat a bite
- **Poisonous plants:** Be able to recognize common poisonous plants, be cautious when working in an area known to have these plants, know how to treat exposure to these plants

2. Best Practices: Discussion

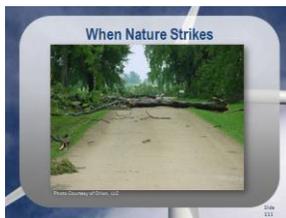
 5 minutes

Cues	What to Do or Say
<p>Facilitator Note</p> <p>Pages 72 and 73</p>	<ul style="list-style-type: none">■ In previous modules, there has been time for you to have employees go through the <i>Best Practices</i> list and assess each item.■ However, since you only have 5 minutes for this segment, you will instead facilitate a short discussion.
<p>PPT-109</p> 	<ul style="list-style-type: none">■ Refer employees to the best practices assessment on Pages 72 and 73.■ Tell them that this assessment is derived from OSHA recommendations for protecting employees from heat and cold.■ It is a list of practices that, if done consistently, can reduce the risk of employees getting overcome by extreme weather conditions.■ Ask employees to review the list briefly, then discuss the assessment by doing the following:<ul style="list-style-type: none">– Ask which items they feel are done particularly well at their worksite.– Ask where they feel improvements can be made.■ Show PPT-109 as you have employees identify one or two items from the assessment that they would like to improve.■ Encourage employees to work on improving the items they have selected.■ When they do this, they will make their worksite safer from injuries caused by extreme heat and cold.

PPT-110



PPT-111



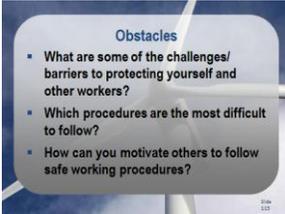
PPT-112



- Show PPT-110 through PPT-112, which are pictures of a wind construction site that was struck by a tornado.
- Tell employees that one important best practice is to have some emergency procedures set up for bad weather.
- Ask employees the following questions.
 - What are our procedures in a severe storm?
 - Where do you go?
 - How do we account for all of our employees?
- Discuss these procedures with employees, filling in information as needed.

3. Obstacles to Using Safe Practices at Your Worksite: Activity

🕒 10 minutes

Cues	What to Do or Say
<p>Page 74</p>	<ul style="list-style-type: none">■ Refer employees to Page 74.■ Tell them that having policies and procedures for safe work practices is good. However, in the real world, things can happen that require impromptu decision making and improvising.■ They are now going to discuss some of the challenges they could face in implementing safe practices at their worksites.
<p>PPT-113</p> 	<ul style="list-style-type: none">■ Show PPT-113, then lead a discussion using the three questions on Page 74 as a guide. Try to get employees to do most of the talking.■ As employees describe their challenges/obstacles, ask others for ideas on how to overcome the challenges. Provide some of your own suggestions as well.■ When time is up, close the discussion by pointing out that there will always be challenges and obstacles, but an important part of building a good safety record regarding falls is to raise the issues, discuss them, and work with other employees and their supervisors to find solutions that work.
<p>Page 75</p>	<ul style="list-style-type: none">■ Refer employees to Page 75. Tell them that this course comes with a <i>Tools and Resources</i> CD.■ They can continually learn new ways to be safe and to overcome safety challenges by referring to this CD from time to time.■ Review the list of items on Page 75, then refer employees to the bottom of the page.■ Ask them what they plan to do differently on their jobs now that they have taken this class.■ Get as many responses as you can in the allotted time.

4. Post-Course Test: Individual Activity

 20 minutes

Cues	What to Do or Say
Post-Course Test	<ul style="list-style-type: none">■ Congratulate employees for finishing the class.■ Tell them they will now take the post-course test.■ Hand out the post-course tests.■ Allow employees about 20 minutes to complete the test.■ Periodically call time to help employees pace themselves.■ When time is up, collect the tests.■ Tell participants their pre- and post-tests will be scored. If they want to know how they did, they can make arrangements with you to find out after the tests are scored.■ Explain that the test scores will be sent to OSHA (anonymously) as a way of learning if the program was effective.■ Their names and businesses will not be sent to OSHA, only the composite test scores.

5. Course Evaluation: Individual Activity

 5 minutes

Cues	What to Do or Say
Course Evaluation	<ul style="list-style-type: none">■ Hand out the course evaluation.■ Tell employees that their feedback of this course is important.■ Ask them to take a few minutes to give their assessment of the program.■ When they are done, collect the evaluations.■ Thank employees for attending the course and for their participation.

