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# MODULE 4

## HAZARD PREVENTION AND CONTROL

### Objectives

At the end of this module, participants will be able to...

- Identify the factors OSHA includes under *hazard prevention and control* in its voluntary Safety and Health Program Management guidelines.
- Understand the key aspects of an engineering design and start-up review.
- Consider other control methods when the hazard cannot be engineered out of the job.
- Recognize the key components of an emergency plan.
- Recognize the key components of a medical program.

### Time

60 minutes: 12:55 to 1:55 PM

Followed by a 10 minute break: 1:55-2:05 PM

### Agenda

1. Introduction to Hazard Prevention and Control—Presentation (5 minutes)
2. OSHA's Guidelines for Hazard Prevention and Control—Presentation and Activity (5 minutes)
3. The Engineering Design and Start-Up Review Process—Discussion (10 minutes)
4. Planning for Emergencies—Presentation and Activity (25 minutes)
5. Determining Hazard Controls—Case Study (15 minutes)

## RECOMMENDED PROCESS

### 1. Introduction to Hazard Prevention and Control—Presentation (5 minutes)

Cues	Content
PPT 4-1	<ul style="list-style-type: none"> <li>■ You will cover Pages 1 and 2 in this segment.</li> <li>■ Show PPT 4-1 as you refer participants to Page 1 in Module 4 of their Participant Guides.</li> <li>■ Introduce the module by saying they'll now be turning their attention to the prevention and control of hazards.</li> </ul>
PPT 4-2 and PPT 4-3	<ul style="list-style-type: none"> <li>■ Show PPT 4-2 and PPT 4-3 to introduce the objectives to this module.</li> <li>■ Refer participants to Page 2.</li> </ul>
Question:	<ul style="list-style-type: none"> <li>■ Ask participants: The title of this module refers to both hazard prevention and hazard control. What is the difference between the two?</li> </ul>
PPT 4-4 Animated	<ul style="list-style-type: none"> <li>■ Show PPT 4-4 as you get some participant responses. Once you've gotten several responses:               <ul style="list-style-type: none"> <li>– Advance PPT 4-4 to reveal the definition of hazard prevention.</li> <li>– Advance PPT 4-4 once again to reveal the definition of hazard control.</li> </ul> </li> <li>■ Finish the discussion by explaining that both hazard prevention and control have the objective of reducing workplace injury and illness.</li> <li>■ Refer participants to the bottom of Page 2.</li> </ul>
PPT 4-5 Animated	<ul style="list-style-type: none"> <li>■ Show PPT 4-5 as you point out that both hazard prevention and hazard control are considered to be a part of the <i>Control</i> portion of the safety process.</li> <li>■ Advance PPT 4-5 to emphasize the <i>Control</i> step.</li> <li>■ Answer any participant questions.</li> </ul>

## 2. OSHA's Guidelines for Hazard Prevention and Control—Presentation and Activity (5 minutes)

Cues	Content
	<ul style="list-style-type: none"> <li>■ You will cover Pages 3 and 4 in this segment. Allocate about the same amount of time to each page.</li> </ul>
Facilitator Note	<ul style="list-style-type: none"> <li>■ It is important to complete the activity on Page 3 because participants will be using the results in Module 6.</li> <li>■ Begin this segment with the following points.               <ul style="list-style-type: none"> <li>– OSHA's Safety and Health Program Management Guidelines identify a number of factors that indicate performance of hazard prevention and control.</li> <li>– These factors are listed on Page 3.</li> </ul> </li> </ul>
PPT 4-6	<ul style="list-style-type: none"> <li>■ Show PPT 4-6. Instruct participants to read this page and check items they feel their organization does well.</li> <li>■ Allow participants a couple minutes to read and check the list, then ask one or two people to share what they think their organization does well.</li> <li>■ Refer participants to Page 4. Tell them that, to establish hazard prevention and control at their worksites, it is important for them to understand the hierarchy of controls.</li> <li>■ Refer participants to the <i>Engineering</i> controls box.</li> </ul>
Question:	<ul style="list-style-type: none"> <li>■ Ask participants: Can anyone tell me what engineering controls are?</li> <li>■ Get a few responses, and emphasize those that are correct.</li> </ul>
Question:	<ul style="list-style-type: none"> <li>■ Ask participants: What are examples of engineering controls?</li> </ul>
PPT 4-7	<ul style="list-style-type: none"> <li>■ Get a few responses, then show PPT 4-7 to illustrate the different types of engineering controls.</li> </ul>

- Question:
- Emphasize that engineering controls are the best type of control because they are built into the system. Whenever possible, an organization should try to implement engineering controls.
  - Refer participants to the *Administrative* controls box.
- Question:
- Ask participants: Can anyone tell me what administrative controls are?
  - Get a few responses, and emphasize those that are correct.
- PPT 4-8
- Ask participants: Who has examples of administrative controls?
  - Get a few responses, then show PPT 4-8 to illustrate the different types of administrative controls.
  - Emphasize that administrative controls are used only when a hazard can't be eliminated with engineering controls.
  - Administrative controls are less effective because they rely on people to make them work.
  - Refer participants to the box that contains *PPE* controls.
- Question:
- Ask participants: Who can tell me what PPE controls are?
  - Get a few responses, and emphasize those that are correct.
- Question:
- Ask participants: What are some examples of PPE controls?
- PPT 4-9
- Get a few responses, then show PPT 4-9 to illustrate the different types of PPE controls.
  - Emphasize that PPE controls don't eliminate the hazard, they simply offer a barrier between the employee and the hazard.
  - For this reason, PPE controls should be used only as a last resort when neither engineering nor administrative controls can be applied.
  - Address any participant questions.

### 3. The Engineering Design and Start-Up Review Process—Discussion (10 minutes)

Cues	Content
	<ul style="list-style-type: none"> <li>■ You will cover Pages 5 through 10 in this segment. Allocate time as follows.               <ul style="list-style-type: none"> <li>– 5 minutes for Pages 5 and 6.</li> <li>– 5 minutes for Pages 7 through 9.</li> <li>– Page 10 is a reference page.</li> </ul> </li> <li>■ Refer participants to Page 5. Make the following points.               <ul style="list-style-type: none"> <li>– The best type of hazard control is prevention.</li> <li>– If an organization can design a hazard out of its operations completely, then it doesn't need to use less effective forms of control.</li> <li>– The engineering design and start-up review process enables an organization to identify and eliminate potential hazards before an operation ever begins by addressing controls in the design phase.</li> </ul> </li> </ul>
PPT 4-10	<ul style="list-style-type: none"> <li>■ Show PPT 4-10 as you give the definition of the engineering design and start-up review process.</li> <li>■ Emphasize that this type of review should be done any time something changes.</li> </ul>
PPT 4-11	<ul style="list-style-type: none"> <li>■ Show PPT 4-11 to discuss when the process should be done.</li> <li>■ Emphasize to participants that if they do this review prior to preparing a budget, they will then be able to include the estimated costs for any design proposals into the budget.</li> </ul>
PPT 4-12	<ul style="list-style-type: none"> <li>■ Show PPT 4-12 to discuss why this review is important.</li> </ul>
PPT 4-13	<ul style="list-style-type: none"> <li>■ Show PPT 4-13 to discuss specifically what the review assesses.</li> </ul>

Question:

- Emphasize how important it is for the review to include all three of these phases by discussing the following example.
  - The regulations for a finished building would require raised walkways to have railings of sufficient height to prevent falls.
  - Yet, when the building is under construction, the same walkways have low or no railings, posing a fall danger to construction workers.
- Refer participants to Page 6. Have participants think about the previous modules they've studied.
- Ask participants: Is it important to have management commitment for an engineering design and start-up review?
- Get some responses. Most participants will correctly state that this type of review wouldn't be possible without management commitment.

Question:

- Ask participants: What about employee involvement? Is it important to have employee involvement?
- Get some responses. Most participants will correctly state that employee involvement would add greatly to the review.

PPT 4-14

- Show PPT 4-14 as you review all the people who should be on the team.
- As you introduce each person, ask participants why it is important to have that person as a part of the team. Here are some potential answers you should receive.
  - **Design engineers** need to hear from users what safety features need to be built into the project.
  - **Construction personnel and machinists** can provide input regarding safety during the construction and manufacturing phases.
  - **End users** can provide information about hazards relating to performing their jobs.

- **Safety personnel** can make certain the project complies with OSHA regulations and other safety standards.
- Refer participants to the middle of Page 6.
- Question: ■ Ask participants: How many of you know or work with an engineer?
- Get a show of hands.
- Question: ■ Ask participants: Do you happen to know if this engineer had any safety training when s/he went to school?
- Get a few responses, then point out that very few engineering schools teach safety as part of their curriculum.
- Therefore, it is important to ensure that the engineer working on the design team has some safety knowledge.
- PPT 4-15 ■ Show PPT 4-15 to review the safety qualifications for engineers who work on the design and start-up review team.
- PPT 4-16 ■ Show PPT 4-16 as you ask participants: In evaluating the performance of a project engineer, what criteria and benchmarks are generally used?
- Get a few responses. Most people will say they are evaluated on meeting budget or deadline.
- Very few will say that engineers are evaluated on safety.
- Make the following points.
  - In a large number of companies, safety is not generally a criterion that is considered in the design phase.
  - Instead, it is implemented later as a much more expensive retro fit.
  - That's why it's important to select engineers with the qualifications you see on this page and to emphasize that their performance will be evaluated on meeting certain safety criteria.

- If your organization has an engineer on staff, that person will need to get the training that will provide these qualifications.
- The employee also needs to understand that safety will be a part of the performance criteria.
- If you hire an engineering firm, you need to ensure that the engineer you get has these qualifications and understands that, in addition to the typical performance criteria, they will also be evaluated on safety criteria.
- Refer participants to the bottom of Page 6. Point out that doing a design and start-up review shouldn't be a challenge for a small business.
- If they don't feel they have the resources or qualifications to perform a review adequately, this list introduces some places where they can seek help.
- Once participants have reviewed the list, answer any questions they have.
- Refer participants to Page 7. Tell them that these are the steps for performing the start-up review process.
- Quickly review the steps on this page and address participant questions.
- Refer participants to Page 8. Introduce this page as follows.
  - So far we've talked about using the design and start-up review process during the design stage of a project.
  - But there is another time when it is important to use, and that is when something changes.
  - The review is necessary so that you can determine whether the change affected your safety and health controls, causing them to be ineffective.
  - The review process you would use is the same.



PPT 4-17 and  
PPT 4-18

- However, since a change can occur at any time (not just at the beginning of a process), it is important to have a prompt—or alert—to remind you of the need for a review.
- Refer to the prompts listed on Page 8. Highlight one or two.
- Tell participants that the hardest part of managing this process is remembering to do it.
- That’s why it’s important to instill a short phrase as a reminder, such as the one at the bottom of this page.
- If you repeat and emphasize this phrase always and often, employees will remember that every change should prompt a safety review.
- Refer participants to Page 9. Emphasize that an important factor the design and start-up team will be addressing is sustainability.
- Show PPT 4-17 and PPT 4-18 to review the questions they can ask to determine the sustainability of a project.
- Refer participants to Page 10. Tell them that this is a reference page their design and start-up team can use when they are performing a design and start-up review.
- Quickly review each item on the form as follows.
  - **Job, task, process, procedure**—they should do one of these worksheets for every job or task they are reviewing.
  - **Step**—each step of the job or task, from start to finish, should be listed.
  - **Related OSHA regulation**—it is important for them to know the OSHA regulations related to each step they are reviewing so they can design controls that meet or exceed the appropriate regulations.
  - **Current or potential hazard**—be sure to get employee input on what these hazards are.

- **Design ideas for eliminating hazards**—although the team can brainstorm many ideas, it is also the team’s responsibility to evaluate each idea and present the most practical/feasible.
- **How to achieve sustainability**—if the team addresses sustainability here, it can be built into the controls.
- **Additional safety components**—emphasize that being in compliance with laws and regulations is the minimum they need to do. They should also consider going beyond what the law requires to be as safe as possible. ANSI standards often go beyond what the law requires.

#### 4. Planning for Emergencies—Presentation and Activity (25 minutes)

Cues	Content
	<ul style="list-style-type: none"> <li>■ You will be covering Pages 11 and 12 for this segment. Allocate time as follows.               <ul style="list-style-type: none"> <li>– 5 minutes for small groups to answer the questions on Page 11.</li> <li>– 10 minutes to discuss participant responses to Page 11.</li> <li>– 10 minutes to discuss Page 12.</li> </ul> </li> </ul>
Question:	<ul style="list-style-type: none"> <li>■ Ask participants: How many of you have an emergency program for your organization?</li> </ul>
Question:	<ul style="list-style-type: none"> <li>■ Look for a show of hands, then ask: What purpose does this plan serve?</li> <li>■ Get a few responses, then refer participants to Page 11. Introduce emergency planning with the following.               <ul style="list-style-type: none"> <li>– No organization ever wants to have an emergency.</li> <li>– That is why it is important to practice hazard prevention and control and to design controls into the work.</li> <li>– However, if controls fail, it is important to have a good emergency program.</li> <li>– As we have already discussed, it is also an OSHA requirement.</li> </ul> </li> <li>■ We're going to do an activity now. Work with three or four other people to answer two questions.               <ul style="list-style-type: none"> <li>– What components should be included in an emergency plan?</li> <li>– How should the plan be communicated to the organization?</li> </ul> </li> </ul>

Optional	<ul style="list-style-type: none"><li>■ If you are running short on time, you can ask half of the groups to work on one question and the other half to work on the second question.</li></ul>
PPT 4-19	<ul style="list-style-type: none"><li>■ Show PPT 4-19 as participants work. When time is halfway up, remind participants to switch questions.</li><li>■ When time is up, lead a debriefing.</li><li>■ <b>Debrief of Question 1:</b> What should be included in the plan?<ul style="list-style-type: none"><li>– Ask participants to share their responses.</li></ul></li></ul>
Flipchart	<ul style="list-style-type: none"><li>– As they respond, write their ideas on a flipchart page.</li><li>– Following is a list of the important components of an emergency plan that are required by OSHA. Use this list to supplement the participants' responses.<ul style="list-style-type: none"><li>• Description of how to report fires and other emergencies</li><li>• Description of evacuation procedures</li><li>• Map of escape routes</li><li>• Procedures to account for all employees after an emergency evacuation has been completed</li><li>• A list of employees (and their phone numbers) who are identified and trained to perform rescue and medical duties</li><li>• Names (or job titles) of people to contact for further information or explanation of the plan</li><li>• Procedures to be followed by employees who remain to operate critical plant operations before they evacuate</li></ul></li><li>– Following is a list of components that are not specifically required by OSHA, but are good to include in an emergency plan.</li></ul>

Flipchart

- Location of exits
  - Description of the alarm system to be used to notify employees to evacuate or take other actions
  - Location of emergency equipment and how to use it
  - Location of shelters
  - Chain of command procedures
  - Procedures for assisting people with disabilities
  - Procedures for spill containment
  - A medical program
  - The site of an alternative communications center to be used in the event of a fire or explosion
  - A secure on- or off-site location to store originals or duplicate copies of accounting records, legal documents, your employees' emergency contact lists, and other essential records
  - A plan for utility shut off and who is responsible
  - A plan for bringing the building back on line once the emergency is over
- **Debrief of Question 2:** How should the emergency plan be communicated to the organization?
- Ask participants to share their responses.
  - As they respond, write their ideas on a flipchart page.
  - Following is a list of the important considerations in communicating the plan. Use this list to supplement the participants' responses.

PPT 4-20

- The plan must be written, and should be in different languages to accommodate employees who don't read in English. For example, many organizations are now hiring Hispanic workers and command of English is not a job requirement. In these cases, the emergency plan should also be written in Spanish.
  - Ideally, every employee should get a copy of the written plan.
  - At the very least, the plan should be visibly posted in each work department or area.
  - Employees should be given training on the plan at least once a year. Training can be in a classroom session, a tailgate meeting, or a practice drill.
  - The organization should consider having periodic evacuation drills.
- Close this activity by referring participants to the note at the bottom of Page 11. If they go to the website listed, they will find an OSHA e-tool that provides guidelines for developing an emergency plan.
  - Refer participants to Page 12. Introduce the medical program with the following.
    - Having a medical program is an essential part of an emergency response program.
    - The goal is to prevent and control work-related injuries and illnesses by using all available health care resources.
    - With a medical program, workers get help as soon as there is a sign of injury or illness.
  - Show PPT 4-20 and review the items on the checklist. Encourage participants to check items their organization does as well as any they think their organization should do.
  - Make the following points as you review the checklist.
    - **Item 1—Manager develops the program**

- Making a manager responsible shows management commitment.
- However, the manager should seek employee input when developing the program.
- **Item 2—Training for key people**
  - It is important to train the people who have responsibilities to perform during an emergency.
  - They need to be trained on what their responsibilities are and how to carry them out, even if their only responsibility is to get out of the building safely.
- **Item 3—System for reporting incidents**
  - Employees need to know that it is important to report both minor incidents as well as major ones.
  - Provide training for employees on how to report the incidents and why it is important.
  - Make someone responsible for analyzing reports to determine if there is an underlying hazard that needs to be addressed.
- **Item 4—Survey of medical facilities**
  - It is important to know ahead of time where you can get medical help if you need it.
  - It is important to contact these facilities ahead of time—build a relationship with them.
  - They may even be willing to assist you in developing your medical plan or in providing training (first aid, emergency procedures) to employees.
- **Item 5—Identification and training of personnel who can advise employees regarding their health**
  - This could be an employee.
  - It might be someone from a local medical facility.

- Maybe someone from your insurance company might be willing to help.
- The idea is to have a point-person for employees to go to with their health and safety concerns.
- **Item 6—Identification of people to perform first aid/CPR/AED**
  - It is important to have a number of people who are trained in these emergency functions.
  - In scheduling and staffing, the supervisor should make sure that at least one of them is on site at all times.
  - You should also have a written roster of names and phone numbers of these people in every department.
  - Employees should be periodically reminded of this list.
- **Item 7—Procedures for handling and reporting injuries**
  - Employees need to know what to do if someone is injured, how best to assist an injured person.
  - They need to know who to contact.
  - They also need to know how to report the injury.
- **Item 8—Emergency procedures**
  - Employees need to know what to do if there is a major emergency, such as a fire or explosion.
  - If fire extinguishers are required or provided in your workplace, OSHA requires you to have an emergency evacuation plan.
- **Item 9—Clear communication about the plan**
  - This communication should occur when the plan is first developed and, ideally, it should be in writing.



- It is also important to provide ongoing and refresher training so employees don't forget what they need to do in an emergency.
- If possible, it is even worthwhile to enact drills, so you can troubleshoot flaws in the program and make improvements.
- **Item 10—Instructions to employees to program their emergency contacts into their cell phones**
  - This could be done as part of a meeting or a training program.
  - Instruct everyone to bring their cell phones and their emergency contact information to the meeting.
  - Use the meeting time to allow everyone to program their phones.
- **Item 11—Medical management program**
  - A medical management program provides for proactive management of injuries.
  - One of its goals is to help injured employees to heal and to return to work safely, which means finding ways to accommodate them, such as reducing their work hours or providing them with different work.
  - Another goal should be to eliminate the conditions/hazards that injured the employee.
- Tell participants that the checklist you have just reviewed is available to them on their *Tools and Resources* CD. They should feel free to print it and use it as a guide for developing a medical program.

## 5. Determining Hazard Controls—Case Study (15 minutes)

Cues	Content
	<ul style="list-style-type: none"> <li>■ You will be covering Pages 13 and 14 in this segment. Allocate time as follows.               <ul style="list-style-type: none"> <li>– About 5 minutes on Page 13.</li> <li>– About 10 minutes on Page 14.</li> </ul> </li> <li>■ Refer participants Page 13. Tell them they are now going to continue working on the case study they began in Module 3.</li> <li>■ Refer participants back to Module 3, Pages 13 through 17 (or to the case study handout if you are using it).</li> </ul>
Flipchart	<ul style="list-style-type: none"> <li>■ Point to the flipchart page you prepared and posted during the case study in Module 3. This is the page that identified the hazards relating to the palletizer incident.</li> <li>■ Remind participants that, in this case study, they identified some of the hazards that may have caused the incident and fatality with the palletizer.</li> <li>■ Now they are going to identify some controls that can be used to prevent future incidents.</li> </ul>
PPT 4-21	<ul style="list-style-type: none"> <li>■ Show PPT 4-21 as you work through the process of identifying controls.</li> <li>■ Point to the first hazard listed on the flipchart page and ask participants to list this hazard in the appropriate space in Page 13.</li> </ul>
Question:	<ul style="list-style-type: none"> <li>■ Ask participants: What are some possible controls that can be used to eliminate or control this hazard?</li> <li>■ Get some responses, and for each control they identify, have them indicate if it is engineering, administrative, or PPE.</li> </ul>
Facilitator Note	<ul style="list-style-type: none"> <li>■ As participants share their answers, write them on a flipchart page as you will use this information in Module 5.</li> </ul>

- Repeat the above process with the remaining hazards that are listed on the flipchart page.
- Although you will get a variety of responses from participants during this exercise, following is a summary of some of the hazards along with their controls.
  - **Hazard:** Lack of inspection procedures.
    - **Control:** Create inspection procedures, put them in writing (in all languages that apply), and provide training on using the procedures. (Administrative)
    - **Control:** Make completion of inspections a part of every supervisor's performance appraisal. (Administrative)
  - **Hazard:** Failure to have palletizer evaluated.
    - **Control:** Conduct immediate evaluation of palletizer and follow-up on all recommendations for making it safer. (Administrative)
  - **Hazard:** Failure to guard palletizer.
    - **Control:** Install guards on palletizer. (Engineering)
    - **Control:** Make it a serious violation of company policy to tamper with guarding. (Administrative)
  - **Hazard:** Failure to require lockout/tagout.
    - **Control:** Immediately create and implement a lockout/tagout procedure. (Administrative)
    - **Control:** Train employees in the proper procedures for lockout/tagout. (Administrative)
    - **Control:** Make it a serious violation of company policy to ignore lockout/tagout policy. (Administrative)
  - **Hazard:** Failure of palletizer to detect pallets

- **Control:** Inspection and possible replacement of sensor (Engineering)
- **Control:** Installing additional sensors (Engineering)
- **Hazard:** Dangerous method for adjusting the palletizer.
  - **Control:** Create procedures for adjusting the palletizer. Include lockout/tagout as part of the procedure. (Administrative)
  - **Control:** Provide training on the correct methods for adjusting the palletizer. (Administrative)
  - **Control:** Make it a serious violation of company policy to ignore these procedures. (Administrative)
- **Hazard:** Culture of overtime
  - **Control:** Consider cutting number of hours by hiring additional employees. (Administrative)
  - **Control:** Mandate work/rest periods when employees are working overtime. (Administrative)
- **Hazard:** Too much pressure to produce quickly.
  - **Control:** Top management needs to evaluate this cultural value and place more emphasis on operating safely. (Administrative)
- When you have finished working through all the hazards, post all the flipchart pages in a visible place in the room as you will use them in Module 5.
- Refer participants to the questions at the bottom of Page 13. Lead a discussion in which participants answer these questions.
- Show PPT 4-22 as you ask the first question: **What is top management's role in implementing these controls?**
- Get some ideas from the group, then add any from the following as you see fit.

PPT 4-22  
Animated

- Top management must create a culture in which supervisors and employees understand that these controls are a priority and must be followed.
  - Top management must allocate funds in the budget to have these controls implemented.
  - Top management must make using these controls a job requirement and build this into all employees' performance criteria.
  - Top management should visit the work area on a regular basis and talk to employees about how things are going and what their safety concerns are.
- Advance PPT 4-22 as you ask the second question: **What is the supervisor's role in implementing these controls?**
- Get some ideas from the group, then add any from the following as you see fit.
- Supervisors must make it clear to their workers that these controls must be followed.
  - Supervisors must listen to employees if they have concerns about these controls and report these concerns to top management.
  - Supervisors must apply the organization's disciplinary process when they see employees subverting the controls.
- Advance PPT 4-22 as you ask the third question: **What is the employee's role in implementing these controls?**
- Get some ideas from the group, then add any from the following as you see fit.
- Employees must use the controls as directed.
  - Employees must share any concerns they have about these controls with their supervisors.

Facilitator Note:

- Employees need to challenge other employees if they see them subverting the controls.

- Refer participants to Page 14.

Question:

- If you are running short on time, you may skip the activity on Page 14.

Question:

- Ask participants: Did anyone notice how many administrative controls were identified in the last exercise?

- Get some responses, then ask: Why weren't more engineering controls identified?

- Get some responses. Reinforce responses that point out the following:

- Engineering controls are more difficult to install after the fact.

- Engineering controls often require substantial budgetary outlays.

- Point out that this reinforces why it is important to have an engineering design and start-up review.

- Tell participants that they are now going to complete an exercise in which they get to decide the design specifications for a new palletizer.

- Introduce the exercise with the following points.

- Let's assume that the management of this company has decided to replace the palletizer.

- In good safety management fashion, they are performing an engineering design and start-up review to determine how to integrate engineering controls into the new machine.

- They have assembled a design team and you are on it.

- Work with three to four other people to complete the worksheet on Page 14.

## PPT 4-23

- Show PPT 4-23 and allow participants about 5 minutes to complete the worksheet.
- As they work, walk around the room to answer their questions and to see what solutions they are finding.
- When time is up, call the group back together and lead a 5 minute debriefing.
- Ask participants to share the design solutions they identified.
- Following is a sampling of the responses they might have.
  - **Hazard:** Lack of inspection procedures/failure to have palletizer evaluated
    - **Design Feature:** Palletizer shuts down if not inspected after a specified period of time
    - **Sustainability Feature:** N/A
  - **Hazard:** Failure to guard palletizer
    - **Design Feature:** Built-in machine guards/machine fails to operate if tampering of guards occurs
    - **Sustainability Feature:** Guards built with sustainable materials
  - **Hazard:** Failure to require lockout/tagout
    - **Design Feature:** Installation of interlocking gates that shut system down if opened
    - **Sustainability Feature:** Gates made in an energy efficient manner with eco-friendly materials
  - **Hazard:** Failure of palletizer to detect pallets
    - **Design Feature:** Built-in sensors that stop machine if pallets go askew
    - **Sustainability Feature:** N/A

- **Hazard:** Dangerous method for adjusting the palletizer
  - **Design Feature:** Use of a robot or robotic arm for adjusting pallets from outside of the pallet area
  - **Sustainability Feature:** Robot made of recyclable materials
- Close the discussion by talking about some general safety and sustainability features.
  - **General Safety Features**
    - Perimeter guarding so that no worker can enter palletizer area without having the machine shut down
    - Feature that automatically locks down moving parts during maintenance
    - Laser scanner for a 360 degree field of protection
    - Scanner that automatically changes safety parameter based on the speed with which the machine is operating
  - **General Sustainability Features**
    - Purchase of a palletizer with a small footprint
    - Purchase of a palletizer that uses less electricity
    - Purchase of a palletizer that uses less air
    - Lightweight palletizer for lighter shipping
- Answer any questions that participants have about the exercise.

10 Minute Break

Take a 10 minute break.