

Job Hazard Analysis



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OSHAcademy Course 706 Study Guide

Job Hazard Analysis

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This study guide is designed to be reviewed off-line as a tool for preparation to successfully complete OSHAcademy Course 706.

Read each module, answer the quiz questions, and submit the quiz questions online through the course webpage. You can print the post-quiz response screen which will contain the correct answers to the questions.

The final exam will consist of questions developed from the course content and module quizzes.

We hope you enjoy the course and if you have any questions, feel free to email or call:

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Course Introduction

This online course explains what a job hazard analysis (JHA) is and offers guidelines to help you conduct your own step-by-step analysis. The course also will help you take the information from a JHA to write a safe job procedure (SJP) that can be used for training employees.

What is a hazard?

A hazard is the potential for harm. In practical terms, a hazard often is associated with a condition or activity that, if left uncontrolled, can result in an injury or illness.

What is a job hazard analysis?

A job hazard analysis is a technique that focuses on job tasks as a way to identify hazards before they occur. It focuses on the relationship between the worker, the task, the tools, and the work environment. Ideally, after you identify uncontrolled hazards, you will take steps to eliminate or reduce them to an acceptable risk level.

Why is job hazard analysis important?

Many workers are injured and killed at the workplace every day. Safety and health can add value to your business, your job, and your life. You can help prevent workplace injuries and illnesses by looking at your workplace operations, establishing safe job procedures, and ensuring that all employees are trained properly.

What is the value of a job hazard analysis?

Supervisors can use the findings of a job hazard analysis to eliminate and prevent hazards in their workplaces. This is likely to result in fewer worker injuries and illnesses; safer, more effective work methods; reduced workers' compensation costs; and increased worker productivity. The analysis also can be a valuable tool for training new employees in the steps required to perform their jobs safely.

This course introduces you to the Job Hazard Analysis process and also touches on how you can use it as a valuable tool for training.

Module 1: Prepare to Conduct the JHA

Introduction

The first step in preparing to conduct a JHA is to review all of the jobs in the workplace and make a list of those jobs that might require a JHA.

Involve Your Employees

Get together with your employees and talk about the actual and potential hazards and unsafe behaviors they believe might exist in their current work and surroundings. Discuss the possible accidents that might result from the hazards and behaviors. Next, come up with ideas to eliminate or control those hazards and behaviors. By the way, if you can eliminate or reduce hazards, don't wait until the JHA is conducted. Eliminate or reduce the hazard as soon as possible.

Employees are Prone to Use Their "Own" Procedures When Not Being Supervised

It is very important to involve your employees in the JHA process because they have a unique understanding of the job, and this knowledge is invaluable for finding hazards. Involving employees will help minimize oversights, ensure a quality analysis, and get workers to "buy in" to the solutions because they've helped in some way to develop the procedures. If they are not involved in developing the JHA, they will not be as likely to "own" the safe job procedures. As a result, they may not want to use safe procedures and practices that they believe have been "imposed" on them.

Look for Hazardous Conditions and Unsafe Behaviors

During the job review process, focus on identifying hazardous conditions and unsafe behaviors. Remember, it takes a hazard and exposure to the hazard before an accident can occur. So, it makes sense to look for them during the review. Sources to help identify hazardous conditions and unsafe behaviors include:

-) Material Safety Data Sheets (MSDSs)
-) Experienced workers
-) Accident and incident reports
-) First aid statistical records
-) Behavior Based Safety (BBS) reports

-) Safety committee meeting minutes
-) Safety inspection reports
-) Previous JHAs
-) Existing work procedures
-) Equipment manuals
-) Preventive/corrective maintenance records

Hazards

If hazards that pose an immediate danger to an employee's life or health exist, take immediate action to protect the worker. Any problems that can be corrected easily should be corrected as soon as possible.

Behaviors

Some jobs may require potentially high-risk behaviors that should be identified in a JHA. High risk behaviors that might increase the probability and severity of an injury or illness include:

-) Working at any elevation
-) Lifting, lowering, pushing, pulling and other manual handling operations
-) Others working above or below the work area
-) Use of bridge cranes, man lifts, or other heavy equipment
-) Working on or near energized equipment/components
-) Working alone or in isolated workplaces
-) Operating vehicles (i.e. trucks, forklifts, etc.)
-) Working within a confined space or under temperature extremes

Review Incident/Accident History

Review your worksite's history of accidents and illnesses that needed treatment and incidents that required repair or replacement of equipment. It's also important to look at near miss events in which an injury did not occur, but could have. These events are indicators that existing hazard controls (if any) may not be adequate and deserve more scrutiny.

Conduct a Risk Analysis

Once you have identified tasks you believe might require a JHA, it's important to prioritize each task. To do this, analyze each task to determine their degree of risk. To determine the degree of risk objectively, it's important to know what risk is, so let's discuss the concept.

Risk = Probability x Severity x Exposure

The overall risk inherent in a job is a function of three variables: probability, severity and duration. The greater the probability, severity and exposure - the higher the risk while doing a job. More on this later.



Probability

Probability describes the likelihood that a worker will be injured or become ill if exposed to a hazard. Common terms used to describe probability are:

-) **unlikely** - Injury from exposure has low probability. Less than 50% chance.
-) **likely** - Injury from exposure has moderate probability. 50/50 Chance.
-) **very likely** - Injury from exposure has high probability. Greater than 50% chance.

Severity

Severity is an estimate of how serious the injury or illness will be as a result of an accident. The severity of an injury or illness for any given exposure is largely fortuitous: it's a matter of chance or luck. For instance someone could fall from a plan and live to tell about it. It's not the fall, it's the nature of the sudden impact and orientation of the body that determines the severity of the injury. The common terms used to describe severity are:

-) **Minor** - other than serious physical harm that does not prevent the employee from continuing to work in the same job.
-) **Serious** - serious physical harm that prevents the employee continuing to work in the same job.
-) **Death** - fatality

Exposure

Exposure is the condition of being exposed to hazard such that the employee is somehow affected by that hazard.

-) Physical exposure can be thought of as "arms- length" exposure to physical hazards. Exposure can be much farther than arms- length if a biological hazard exists. If the employee can get injured or ill as a result of proximity to a danger zone, physical exposure exists.
-) Environmental exposure occurs when the employee can suffer some kind of injury or illness as a result of a hazardous environment. Distance does not matter. For instance, an employee may suffer hearing loss as a result of working near loud continuous noise sources.

Factors that Increase Risk

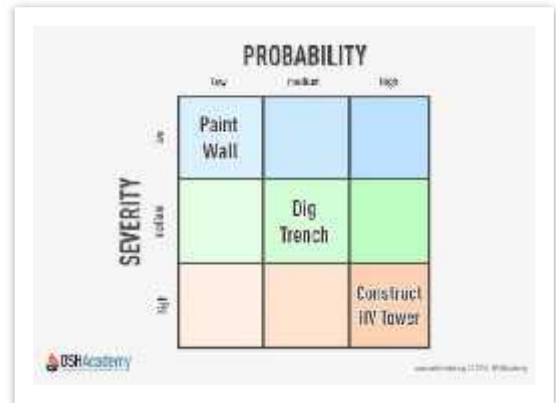
There are many factors that may increase the probability and severity of an accident. You may need to be able to discuss the factors that you considered if someone wants you to justify the particular level of risk at which you arrived. Some of these factors include:

-) The number of employees exposed to hazards
-) The number of hazards in the procedure
-) The number of opportunities for unsafe behaviors
-) The frequency of exposure to hazards
-) The employee's belief about the hazards
-) The duration of exposure to specific hazards

-) The proximity of employees to the point of danger
-) The complexity of the procedure
-) Potential severity of the injury or illness when exposed
-) Unreasonable workload (physically/mentally incapable of meeting expectations)
-) Working under distress (hurry, fatigue, illness, and personal problems).

The Risk Assessment Matrix

Another simple technique to help determine the overall risk of the jobs for which you'll be conducting a JHA, is called the Risk Assessment Matrix. It's a simple process to determine the risk level of each job:



1. List all of the jobs that you are analyzing.
2. Estimate the probability and severity of each job.
3. Next, place the task in the appropriate section of the risk matrix.

Once you've entered all tasks, you can easily prioritize each job to determine which jobs to analyze first.

To Determine Risk, Crunch the Numbers

To more precisely determine risk, you may want to use numerical values like those described in the tables below. Quantifying risk helps justify how you've prioritized jobs. Using the two tables at the right, you can develop "risk scores" to indicate the degree of risk in each job.

For example, a job in which exposure to a danger zone is likely to result in an injury or illness would receive a score of "6" in the table above.

In this case, a job in which exposure might result in a lost time injury to one worker would receive a score of "50".

Multiplying the Probability Score (6) by the Severity Score (50) in the example to the right would result in a Risk Score of 300. You might consider any job with a risk score of 200 or higher to be a high risk and, therefore, the Risk Score in this example indicates conducting a JHA on this job should be a top priority.

Prioritize Jobs - Worst First

Now that you have some idea how much risk is involved in each job, you can prioritize them. As mentioned earlier, a common strategy is to prioritize the most hazardous job first. If a JHA is required for many tasks in your workplace, priority should go to the following types of jobs, in order of priority:

1. Jobs with the highest injury or illness rates;
2. Jobs with the potential to cause severe or disabling injuries or illness, even if there is no history of previous accidents;
3. Jobs in which one simple human error could lead to a severe accident or injury;

PROBABILITY - THE LIKELIHOOD OF INJURY OR ILLNESS

Criteria	Rating
Is the most likely and expected result if employees enter danger zone.	10
Is quite possible, would not be unusual, has an even 50/50 chance.	6
Would be an accident waiting for someone.	3
Would be remotely possible, confidence has been known to lose its appeal.	1
Extremely remote, but possible. Has never happened after many years of experience.	0.5
Practically impossible situation in which it has never happened when exposed.	0.1

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SEVERITY - THE MOST LIKELY CONSEQUENCE

Criteria	Rating
Catastrophic: Fatal injury to multiple workers.	100*
Single fatality.	50
Lost Time Injury to multiple workers.	30*
Single Lost Time injury to one worker.	10
Non-Lost Time injury.	1

* multiply score by number of workers.

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4. Jobs that are new to your operation or have undergone changes in processes and procedures; and
5. Jobs complex enough to require written instructions.

OSHAcademy Student Opinion

William I. says it's important to understand that all the (potentially) "severe events" should be addressed first, then down to critical, etc. William has seen many cases where customers and safety professionals have focused on frequency issues because there is data to review and success to demonstrate. Meanwhile, they ignore large loss potential events until they occur. In his opinion, as you address the large loss potential events, there is a corollary benefit to the "less severe but more frequent" incidents.

Module 1 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. Any problems that can be corrected easily should be corrected _____.**
 - a. within the same day
 - b. as soon as possible
 - c. immediately after the JHA is completed
 - d. in a timely manner after the JHA is complete

- 2. The first step in preparing for a JHA is to _____.**
 - a. develop the sequence of steps
 - b. review accident history
 - c. conduct a preliminary job review
 - d. determine the risk

- 3. All of the following are factors that increase risk of injury, except _____.**
 - a. Proximity of employees
 - b. Lack of stress inherent in the job
 - c. Frequency and duration of exposure
 - d. Number of employees exposed

- 4. Why is it important to involve employees in the hazard analysis process?**
 - a. Ensures they are held accountable
 - b. They have common sense about work
 - c. They will feel ownership in the process
 - d. Ensures a generic approach

5. Which of the following job categories would be considered the highest priority for a JHA?

- a. Jobs that are new to the operation
- b. Jobs that have undergone changes in processes
- c. Jobs that could cause a severe or disabling injury
- d. Jobs with the highest injury or illness rates

Module 2: List the Procedure Steps

Introduction

Nearly every task can be broken down into a series of steps. Developing steps for a job is critical in the analysis process to improve the efficiency and effectiveness of each task.

One Step - One Action

The process of "analysis" in the context of a JHA includes breaking the "whole" procedure down into its basic steps. The idea is to carefully describe actions and hazards within each step, and how to mitigate those hazards through control strategies.

Each step in the task being analyzed will describe an action. It tells what the worker does in each step.

Actions may or may not be observable. An action may describe something that is done or not done.

The Two Components of a Step: the Actor and the Action

Each step of a procedure describes what the worker (actor) does (action), so let's take a look at each of these two components.

-) Actor. The actor is an individual or object that directly participates or assists in the procedure. The actor initiates a change by performing or NOT performing a particular action in a step. In most JHA's the act need not be identified unless two more workers are performing the task.
-) Action. An action is "the something" that is done by an actor. Actions may or may not be observable. An action may describe a behavior that is accomplished or not accomplished. NOT performing an action should be thought of as just as important as performing an action when developing a step.

It's important to understand that when describing a step in writing, first identify the actor (if two or more workers are involved in the step) and then tell what the actor is supposed to do. For instance, take a look at the step below:

"Maintenance team leader: Attach the lockout device to the hasp."

In this example, the actor is identified because a team of maintenance workers is performing the task. The actor (Maintenance team leader) is identified first and then the action (attach) is described.

Also note that the statement is written in active tense. You would not state the step in passive tense. See the example of passive tense below:

"The lockout device is to be placed on the hasp by the maintenance team leader."

Tips on Conducting the JHA

-) Be sure to record enough information to describe each job action without getting overly detailed at this point. You will include more detail later in the safe job procedure.
-) Avoid making the breakdown of steps so detailed that it becomes unnecessarily long. On the other hand, don't make it so broad that it does not include basic steps.
-) Get input from other workers who have performed the same job.
-) Review the job steps with an employee to make sure you have not omitted something.
-) Point out that you are analyzing the task, not evaluating the employee's job performance.
-) Include the employee in all phases of the analysis—from reviewing the job steps and procedures to discussing hazards and solutions.
-) It may be helpful to photograph or videotape the worker performing the job.

The JHA Format

The following task description will be used throughout the course to show how a job hazard analysis develops. As you can see, the JHA format includes three columns.

1. Basic Job Step
2. Hazards Present
3. Preventive Measures


The sample JHA below is used throughout the course and describes loading an empty truck trailer with pallets of product.

Sample JHA Worksheet

Job Description: Loading an empty trailer with pallets of product

JOB DESCRIPTION: Loading an empty trailer with pallets of product.

BASIC JOB STEP	HAZARDS - POSSIBLE INJURIES	PREVENTIVE MEASURES
1. Ensure that the trailer is correctly spotted.		
2. Chock wheels; place jacks under trailer nose.		
SAFE JOB PROCEDURE		



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Module 2 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. An _____ process breaks the "whole" down into its basic parts, steps, events, and components. The idea is to determine how the step relates to the whole.**
 - a. audit
 - b. assessment
 - c. evaluation
 - d. analysis

- 2. Each step in a task describes a unique _____.**
 - a. result
 - b. action
 - c. behavior
 - d. condition

- 3. When conducting a JHA, _____ the task rather than _____ employee performance.**
 - a. analyze, auditing
 - b. audit, analyzing
 - c. evaluate, analyzing
 - d. analyze, evaluating

- 4. Which of the following is a helpful strategy when conducting a JHA?**
 - a. Make the breakdown of steps too detailed
 - b. Use photographs or videotapes
 - c. Be sure details are broad
 - d. Exclude employees in the process

- 5. Developing steps is critical in the analysis process to improve the _____ of each task.**
- a. understanding
 - b. behavior
 - c. results
 - d. efficiency and effectiveness

Module 3: Describe the Hazards in Each Step

Introduction

A very important part in the JHA development process is to discover the hazards lurking within each step. A basic safety concept must be understood by all safety staff: to have an accident, a hazard and exposure to the hazard must exist.

-) A hazard is an unsafe condition that could cause injury or illness to an employee.
-) Exposure usually refers to an employee's placement relative to the hazard's "danger zone". If the employee is within the danger zone, the employee is exposed.

How to Identify Hazards

A job hazard analysis is an exercise in detective work. Your goal is to discover the following:

-) What can go wrong?
-) What are the consequences?
-) How could the hazard arise?
-) What are other contributing factors?
-) How likely is it that the hazard will occur?

To make your JHA useful, document the answers to these questions in a consistent manner. Describing a hazard by answering the questions above ensures you target the most important contributors to the hazard.

Scenario

Rarely is an accident a simple case of a single event or cause. More frequently, many contributing events tend to line up to create the hazard. Here is an example of a hazard scenario that illustrates this idea: Chipperman's arm amputated while clearing jam

Wood coming from the infeed rollers jammed up as it fell onto the chipper conveyor belt. A chipperman tried to clear the jam without turning off any part of the machine or using a picaroon. His hand and arm were caught up in the teeth of the rotating rollers, and his body was pulled onto the chipper conveyor. The chipperman's arm was twisted off at the shoulder. Another worker heard his cries and rescued him before he was pulled into the chipper.

(Source: [Worksafe BC](#))

Now, let's pretend the accident didn't happen and it was your job to identify the hazards and exposure inherent in this task. Let's ask the questions:

-) What can go wrong? The worker's hand could come into contact with a rotating object that "catches" it and pulls it into the machine.
-) What are the consequences? The worker could receive a severe or fatal injury.
-) How could it happen? The accident could happen as a result of the worker trying to clear a snag during operations or as part of a maintenance activity while the conveyor is operating. Obviously, this hazard scenario could not occur if the conveyor is not rotating.
-) What are other contributing factors? The hazards and exposure related to this task can occur very quickly. It does not give the worker much opportunity to recover or prevent it once his hand comes into contact with the rotating rollers. This is an important factor, because it helps you determine the severity and likelihood of an accident when selecting appropriate hazard controls. Unfortunately, experience has shown that training is not very effective in hazard control when triggering events happen quickly because humans can react only so quickly.
-) How likely is it that the hazard will occur? This determination requires some judgment. If there have been "near-misses" or actual cases, then the likelihood of a recurrence would be considered high. If the pulley is exposed and easily accessible, that also is a consideration. In this example, the likelihood that the hazard will occur is high because there is no guard preventing contact, and the operation is performed while the machine

is running. By following the steps in this example, you can organize your hazard analysis activities.

Don't Forget Potential Hazards

To ensure all hazards are identified, analyze each step to uncover potential, as well as actual, hazards produced by both the work environment and the action. Be sure to consider the questions below.

-) Is there danger of striking against, being struck by, or otherwise making harmful contact with an object?
-) Can the worker be caught in, by, or between objects?
-) Is there potential for a slip or trip?
-) Can the employee fall from one level to another or even on the same level?
-) Can pushing, pulling, lifting, lowering, bending, or twisting cause strain?
-) Is the work environment hazardous to safety or health?
-) Are there concentrations of toxic gas, vapor, fumes, or dust?
-) Are there potential exposures to heat, cold, noise, or ionizing radiation?
-) Are there flammable, explosive, or electrical hazards?

Common Hazards and Descriptions

Chemical (Toxic): A chemical that exposes a person by absorption through the skin, inhalation, or through the blood stream that causes illness, disease, or death. The amount of chemical exposure is critical in determining hazardous effects. Check Safety Data Sheets (SDS), and/or OSHA 1910.1000 for chemical hazard information.

Chemical (Flammable): A chemical that, when exposed to a heat ignition source, results in combustion. Typically, the lower a chemical's flash point and boiling point, the more flammable the chemical. Check SDS for flammability information.

Chemical (Corrosive): A chemical that, when it comes into contact with skin, metal, or other materials, damages the materials. Acids and bases are examples of corrosives.

Explosion (Chemical Reaction): Self-explanatory.

Explosion (Over Pressurization): Sudden and violent release of a large amount of gas/energy due to a significant pressure difference, such as rupture in a boiler or compressed gas cylinder.

Electrical (Shock/Short Circuit): Contact with exposed conductors or a device that is incorrectly or inadvertently grounded. Example: a metal ladder comes into contact with power lines. 60Hz alternating current (common household current) is very dangerous because it can stop the heart.

Electrical (Fire): Use of electrical power that results in electrical overheating or arcing to the point of combustion or ignition of flammables, or electrical component damage.

Electrical (Static/ESD): The moving or rubbing of wool, nylon, other synthetic fibers, and even flowing liquids can generate static electricity. This creates an excess or deficiency of electrons on the surface of material that discharges (spark) to the ground resulting in the ignition of flammables or damage to electronics or the body's nervous system.

Electrical (Loss of Power): Safety-critical equipment failure as a result of loss of power.

Ergonomics (Strain): Damage of tissue due to overexertion (sprains and strains) or repetitive motion.

Ergonomics (Human Error): A system design, procedure, or equipment that is error-provocative (A switch goes up to turn something off).

Excavation (Collapse): Soil collapse in a trench or excavation as a result of improper or inadequate shoring. Soil type is critical in determining the hazard likelihood.

Fall (impacts): Conditions that result in falls from (Slip, Trip) height or traditional walking surfaces (such as slippery floors, poor housekeeping, uneven walking surfaces, exposed ledges, etc.).

Fire/Heat: Temperatures that can cause burns to the skin or damage to other organs. Fires require a heat source, fuel, and oxygen.

Mechanical: Self-explanatory. Typically occurs when devices exceed designed capacity or are inadequately maintained. Skin, muscle, or body part exposed to crushing, caught-between, cutting, tearing, shearing items or equipment.

Noise: Noise levels (>85 dBA 8 hr TWA) that result in hearing damage or inability to communicate safety-critical information.

Radiation (Ionizing): Alpha, Beta, Gamma, neutral particles, and X-rays that cause injury (tissue damage) by ionization of cellular components.

Radiation (Non-Ionizing): Ultraviolet, visible light, infrared, and microwaves that cause injury to tissue by thermal or photochemical means.

Struck By (Mass Acceleration): Accelerated mass that strikes the body causing injury or death (Examples are falling objects and projectiles).

Struck Against: Injury to a body part as a result of coming into contact of a surface in which action was initiated by the person. (An example is when a screwdriver slips.)

Temperature (Heat/Cold): Temperatures that result in heat stress, extreme exhaustion, or metabolic slow down such as hypothermia.

Vibration: Segmental or whole-body vibration can cause damage to nerve endings, and organs.

Visibility: Lack of lighting or obstructed vision that results in an error or other hazard.


Weather Phenomena (Snow/Rain/Wind/Ice): Self-explanatory.

Let's see what the sample JHA looks like now that we've identified some hazards in each step.

Sample JHA Worksheet

JOB DESCRIPTION: Loading an empty trailer with pallets of product.

BASIC JOB STEP	HAZARDS - POSSIBLE INJURIES	PREVENTIVE MEASURES
1. Ensure that the trailer is correctly spotted.	Worker could be caught between backing trailer and dock. Worker could fall from the dock.	
2. Chock wheels; place jacks under trailer nose.	Worker could fall on stairs going to dock well. Head could be stuck against trailer. Worker could slip on ice or snow.	
SAFE JOB PROCEDURE		



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Module 3 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. An unsafe condition that could cause injury or illness to an employee is called - _____.**
 - a. a hazard
 - b. exposure
 - c. an accident
 - d. an incident

- 2. This term usually refers to an employee's placement relative to the hazard's "danger zone."**
 - a. Hazard
 - b. Exposure
 - c. Accident
 - d. Incident

- 3. A job hazard analysis is an exercise in detective work. Your goal is to discover all of the following, except _____.**
 - a. what can go wrong
 - b. who went wrong
 - c. how a hazard could arise
 - d. what are the contributing factors

- 4. Which of the following should be considered as a factor for increasing the likelihood of a recurrence of an accident?**
 - a. A general lack of common sense
 - b. The same person gets hurt
 - c. A history of near-misses
 - d. An increase in workers' compensation costs

- 5. Which of the following should be done to ensure that all hazards associated with a step are identified?**
- a. Audit for system consequences
 - b. Determine the natural consequences
 - c. Evaluate each step for system flaws
 - d. Uncover potential and actual hazards

Module 4: Develop Preventive Measures

Introduction

After reviewing your list of hazards with the employee, next consider using hazard control methods that will eliminate or reduce them.

There are two primary strategies to permanently or temporarily reduce the risk of injury. Each of these strategies employs a number of methods.

Hazard Control Strategies

Information obtained from a job hazard analysis are most useful when hazard control measures are developed and incorporated into the job. Everyone needs to recognize that not all hazard control strategies are equal. Some are more effective than others at reducing the risk in the job.

Remember, a very basic hazard control principle is that we must either (1) eliminate the hazard or (2) control exposure to the hazard. The second principle is that it's more effective to eliminate the hazard, if you can, than to control exposure to the hazard. After all, if you can get rid of the hazard, you don't have to manage the exposure. These two important principles guide safety and health professionals in constructing a "hierarchy" of hazard control strategies.

Traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective controls. ANSI Z10-2005, Occupational Health and Safety Management Systems, encourages employer employ the following hierarchy of hazard control strategies:

1. Elimination
2. Substitution
3. Engineering controls
4. Administrative controls
5. Personal protective equipment (PPE)

The idea behind this hierarchy is that the control methods at the top of the list are potentially more effective and protective than those at the bottom. Following the hierarchy normally leads to the implementation of inherently safer systems, ones where the risk of illness or injury has been substantially reduced. Let's take a closer look at the hierarchy of control strategies.

Elimination and Substitution

Elimination and substitution, while most effective at reducing hazards, also tend to be the most difficult to implement in an existing process. If the process is still at the design or development stage, elimination and substitution of hazards may be inexpensive and simple to implement. For an existing process, major changes in equipment and procedures may be required to eliminate or substitute a hazard.

These strategies are considered first because they have the potential of completely eliminate the hazard, thus greatly reducing the probability of an accident. Redesigning or replacing equipment or machinery may be expensive, but remember the average direct and indirect cost of a lost-work injury can be more than \$50,000 and easily more than \$1 million to close a fatality claim.

Some examples of these two strategies include:

-) Removing the source of excessive temperatures, noise, or pressure
-) Substituting a toxic chemical with a less toxic or non-toxic chemical

Engineering Controls

If you cannot eliminate or substitute a hazard, the next best strategy is to "engineer the hazard out" by using control methods that physically change a machine or work environment. Engineering controls are built into the design of a facility, equipment or process to minimize the hazard. Engineering controls are a very reliable way to control worker exposures as long as the controls are properly designed, used and maintained.

If, during the JHA, you discover a hazard that can be engineered out, do it. Turn the dangerous step into a safe step that doesn't require safety precautions.

Engineering controls may include:

-) Enclosing the hazard using enclosed cabs, enclosures for noisy equipment, or other means;
-) Isolating the hazard with interlocks, machine guards, blast shields, welding curtains, or other means; and
-) Removing or redirecting the hazard such as with local and exhaust ventilation.

Administrative Controls

This is the "next best" strategy, if engineering control methods are insufficient. Since we can't get rid of the hazard in a JHA step, we'll need to manage exposure to it with safety precautions. Why are administrative controls lower on the hierarchy of controls? To work, administrative controls must rely on appropriate human behavior. According to Arthur Bloch's *Murphy's Law - Book Two*, "any system relying on human behavior is inherently unreliable." That's the problem. Humans can be rather unpredictable. Methods to eliminate or reduce employee exposure to hazards include:

-) Developing new policies, procedures, and practices to reduce frequency/duration of exposure
-) Revising work schedules to reduce the frequency/duration of exposure
-) Monitoring the use of highly hazardous materials
-) Alarms, signs, and warnings
-) Buddy system
-) Training

Note: Administrative controls may also be referred to as "work practice" controls in other safety-related literature.

In a best case scenario, you might be able to eliminate the need for administrative controls if hazards can be eliminated through the use of engineering controls. The more reliable or less likely a hazard control method can be circumvented, the better. Bottom line: If you can get rid of the hazard, you don't have to manage exposure!

Personal Protective Equipment

Many procedures developed with a JHA will include the need to use PPE. Examples of PPE include respirators, hearing protection, protective clothing, safety glasses, and hardhats. PPE, as an administrative control strategy, is acceptable as a control method in the following circumstances:

-) When engineering controls are not feasible or do not totally eliminate the hazard
-) While engineering controls are being developed

-) When safe work practices do not provide sufficient additional protection
-) During emergencies when engineering controls may not be feasible

Using a lower priority hazard control method over another higher priority control strategy may be appropriate for providing interim (temporary) protection until the hazard is abated permanently. If you can't eliminate the hazard entirely, the interim control measures will likely be a combination of control methods used together.

Involve employees

However you decide to correct the hazards you've identified during the JHA, be sure to discuss your ideas with all employees who perform the job and consider their responses carefully. If you plan to introduce new or modified job procedures, be sure they understand what they are required to do and the reasons for the changes. The number one reason employees do not follow procedures is because they just don't know why the procedures are important.

Sample JHA Worksheet

Now let's take a look at what our sample JHA looks like now that we've identified some hazards and their related preventive measures in each step.

JOB DESCRIPTION: Loading an empty trailer with pallets of product.

BASIC JOB STEP	HAZARDS - POSSIBLE INJURIES	PREVENTIVE MEASURES
1. Ensure that the trailer is correctly spotted.	Worker could be caught between backing trailer and dock. Worker could fall from the dock.	Stay clear of the doorway while the trailer is being backed onto the dock. Keep others away from the area. Remove awareness chain or bar from the front of the dock door once the trailer is properly spotted.
2. Chock wheels; place jacks under trailer nose.	Worker could fall on stairs going to dock well. Head could be stuck against trailer. Worker could slip on ice or snow.	If the truck driver has not chocked the wheels, go down the ramp/stairs to the dock well and chock the wheels. Use caution when walking on snow or ice. Hold onto handrails; use ice-melt chemical if needed. When placing the chock, avoid bumping the head on the underside of the trailer. Place jacks under the nose of the trailer. If the dock is equipped with an automatic trailer restraint, push the button to activate the device.
SAFE JOB PROCEDURE		

Module 4 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. Which of the following is considered an engineering control?**
 - a. Revise procedure
 - b. Personal protective equipment
 - c. Enclosure
 - d. Scheduling

- 2. Which of the following is considered a management control?**
 - a. Replacement
 - b. Training
 - c. Enclosure
 - d. Equipment design

- 3. If you can get rid of the _____, you don't have to manage _____!**
 - a. behavior, hazard
 - b. hazard, condition
 - c. exposure, hazard
 - d. hazard, exposure

- 4. PPE, as a management control strategy, is acceptable as a control method in which of the following circumstances?**
 - a. When other safe work practices do not provide adequate protection
 - b. While engineering controls are being developed
 - c. When engineering controls are not feasible
 - d. All of the above

5. The number one reason employees do not follow procedures is because _____.

- a. management doesn't walk the talk
- b. they haven't been trained
- c. they don't know why the procedures are important
- d. people naturally take risks

Module 5: Write the Safe Job Procedure (SJP)

Introduction

The safe job procedure is the final result or product of the JHA process. The safe job procedure is an excellent document to use as a training lesson plan. In fact, you might include the safe job procedures you've developed as part of the safety training plan.

If the safe job procedure is poorly written and hard to understand (doesn't pass the "dummy test"), the JHA may not be effective as an on-the-job training tool. It's important to write a clear, concise, and concrete safe job procedure. So, let's take a look at some of the best strategies in writing safe job procedures.

Points to Remember

-) Write in a step-by-step format. Usually, this means writing a number of paragraphs. Each paragraph should attempt to:
 1. Describe the step. Remember each step describes one action. For example, you might say, "*Grasp the breaker switch and move it from the on to the off position (down).*"
 2. Point out the hazard. If a step includes exposure to a hazard, there are four parts to the step:
 - a. state the action
 - b. identify the hazard
 - c. describe the possible injury the hazard could cause
 - d. identify the safety precaution to prevent the injury

For instance, you would continue the warning by saying, "Grasp the breaker switch and move it from the on to the off position (down). To prevent a possible serious burn injury if an arc flash occurs, be sure you turn your head and look away as you flip the breaker switch."

-) Paint a word picture - concrete vs. abstract. The idea is to write the procedure in such a way that someone who is not familiar with the task can actually "see" each step occur. When writing safe job procedures, we tend to write in a technical style because it seems to be more "efficient." However, if you are going to use the safe job procedure as a

lesson plan for conducting safety training, it's probably a good idea to write in a more interesting conversational style.

- J Write in the second person. For example, say "*Be sure you...*". Try to avoid writing in the third person such as, "*Be sure the worker...*". In most steps you won't have to worry about this because the person you are writing to is implied.
- J Write in the present tense. Say "*take*" rather than "*should be taken*." This helps to create the word picture and streamline the safe job procedure.
- J Write as clearly as possible. Say "use" rather than "utilize." Replacing more complex words with simple words helps to make sure your employees comprehend the material.
- J If you use acronyms or jargon, make sure the meaning of the acronym is spelled out when first used. Make sure jargon is explained on first use.
- J Remind the worker why it is important to do the step safely. Unfortunately, OR-OSHA rules don't emphasize this important part of the training. Nevertheless, you should always discuss the natural and system consequences of the employee's personal behavior. Remember, there is no successful safety management system without effective accountability.
- J Include notes, cautions, or warnings. Tell the employee about the dangers and safety precautions to reduce the dangers in each step. Doing this also helps to emphasize the costs (injury, illness) and benefits (health) of using safety precautions.
- J Keep sentences short. Grammar checker software can help you do this. Usually, a sentence of 7-15 words is adequate.

Sample JHA Worksheet

JOB DESCRIPTION: Loading an empty trailer with pallets of product.

BASIC JOB STEP	HAZARDS - POSSIBLE INJURIES	PREVENTIVE MEASURES
1. Ensure that the trailer is correctly spotted.	<p>Worker could be caught between backing trailer and dock.</p> <p>Worker could fall from the dock.</p>	<p>Stay clear of the doorway while the trailer is being backed onto the dock. Keep others away from the area.</p> <p>Remove awareness chain or bar from the front of the dock door once the trailer is properly spotted.</p>
2. Chock wheels; place jacks under trailer nose.	<p>Worker could fall on stairs going to dock well.</p> <p>Head could be stuck against trailer.</p> <p>Worker could slip on ice or snow.</p>	<p>If the truck driver has not chocked the wheels, go down the ramp/stairs to the dock well and chock the wheels.</p> <p>Use caution when walking on snow or ice. Hold onto handrails; use ice-melt chemical if needed. When placing the chock, avoid bumping the head on the underside of the trailer.</p> <p>Place jacks under the nose of the trailer. If the dock is equipped with an automatic trailer restraint, push the button to activate the device.</p>
SAFE JOB PROCEDURE		
<p>Step 1: Make sure the trailer is correctly spotted. It's important to follow these procedures so you don't get caught between the backing trailer and dock or fall from the dock. Be sure you stay clear of the doorway while the trailer is being backed onto the dock. Keep others away from the area. Remove the awareness chain or bar from the front of the dock door once the trailer is properly spotted.</p> <p>Step 2: Check the wheels. If the truck driver has not chocked the wheels, go down the file ramp/stairs to the dock well and chock the wheels. Be careful when walking on snow or ice so that you don't slip or fall. Hold onto handrails and use ice-melt chemical if needed. When you place the chock, be careful you don't bump your head on the underside of the trailer. Place the jacks under the nose of the trailer. If the dock is equipped with an automatic trailer restraint, push the button to activate the device.</p>		



Module 5 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. If the safe job procedure is hard to understand, the JHA may not be as effective as _____.**
 - a. a hazard survey
 - b. a management control tool
 - c. an on-the-job training tool
 - d. an analysis tool

- 2. If a step includes exposure to a hazard, which of the following is one of the four parts to the step?**
 - a. Identify the details
 - b. Describe the accident
 - c. Describe the possible injury
 - d. Identify the consequence of non-compliance

- 3. Write the safe job procedure in the _____ person.**
 - a. first
 - b. second
 - c. third
 - d. fourth

- 4. Which of the following should be included in the safe job procedure (SJP)?**
 - a. Notes
 - b. Cautions
 - c. Warnings
 - d. All of the above

5. **Including notes, cautions, and warnings in the SJP help to emphasize which of the following?**
- a. Costs vs. benefits
 - b. Leading vs. trailing indicators
 - c. Profit vs. loss
 - d. Conditions vs. behaviors

Module 6: Improve the JHA Process

Introduction

Periodically reviewing your job hazard analysis ensures that it remains current and continues to help reduce workplace accidents and injuries. Even if the job has not changed, it is possible that during the review process you will identify hazards that were not identified in the initial analysis.

It is particularly important to review your job hazard analysis if an illness or injury occurs on a specific job. Based on the circumstances, you may determine that you need to change the job procedure to prevent similar incidents in the future. If an employee's failure to follow proper job procedures results in a "close call," discuss the situation with all employees who perform the job and remind them of proper procedures.

-) It may also be possible that the problem is with the procedure. Maybe it needs to be changed. Talk with employees about their reasons for the apparent unsafe behavior. You might be surprised to learn they have been "trapped" into doing the task that way.
-) On the other hand, discipline may be appropriate if the safety management system has not failed the employee (the employer is meeting all safety obligations).

Any time you revise a job hazard analysis, it is important to train all employees affected by the changes in the new job methods, procedures, or protective measures adopted.

When is it Appropriate to Hire a Professional to Conduct a Job Hazard Analysis?

If your employees are involved in many different or complex processes, you may need professional help conducting your job hazard analyses. Sources of help include your insurance company, the local fire department, and private consultants with safety and health expertise. Some state OSHA agencies may offer assistance through consultation services.

Even when you receive outside help, it is important that you and your employees remain involved in the process of identifying and correcting hazards because you are on the worksite every day and most likely to encounter these hazards. New circumstances and a recombination of existing circumstances may cause old hazards to reappear and new hazards to appear. In addition, you and your employees must be ready and able to implement whatever hazard elimination or control measures a professional consultant recommends.

What Does an Improved JHA Look Like?

To improve the JHAs and its related SJP, think about the "ergonomics" of the job. Find ways to further reduce lifting, lowering, pushing, pulling, carrying, throwing, holding, twisting, or tasks using force. A SJP should remove any unnecessary actions and prevent the need to do things more than once if possible. There should be a little heavy carrying as possible and also include rest breaks if needed. If feasible, provide mechanical aids such as hoists, adjustable workbenches, and hooks. Make sure tools and equipment are position so that they are in easy reach.

What are Some Tips to Improving the JHA?

A solid JHA improvement process will make good use of the experience and knowledge of workers and subject matter experts (SMEs) various safety and health specialties to review the tasks and identify new hazards. SMEs provide a level of involvement as experts in their field. They can effectively review the tasks and the hazards identified to determine the proper set of controls required. Workers and SMEs can also help improve the methods to communicate instructions or procedures.

Any time you revise a job hazard analysis, it is important to train all employees affected by the changes in the new job methods, procedures, or protective measures adopted.

Improve the JHA Process by Taking a Team Approach

To further improve the quality of your JHA program, you may want to establish a formal JHA Team.

The JHA team membership might consist of:

-) the first line supervisor, or designee, of the affected area as Team Leader
-) non-exempt employees experienced in the job that the JHA will be conducted on. If this is a new type of task experienced employees will probably not be available.
-) additional subject matter expert resources as needed to evaluate the task, including, but not limited to the area safety engineer, industrial hygienist, safety manager, fire protection, emergency preparedness coordinator, or safety observer, etc.

The JHA team might be responsible for:

-) developing a JHA by defining the key steps of each job, identifying the potential hazards of each key step and recommending safe practices (e.g., engineering controls, administrative controls, etc.) to eliminate or reduce each hazard/exposure
-) conducting the JHA for the selected process or activity by discussing and completing each of the sections on the JHA form
-) recommending any changes required to facilitate personnel safety; including, but not limited to, specific procedures, policies, equipment, training, etc., that may be involved
-) providing the appropriate manager with a completed copy of the JHA

Module 6 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

- 1. It's particularly important to review a JHA if _____.**
 - a. the annual review date has past
 - b. an injury or illness occurs on a specific job
 - c. two or more employees have demonstrated noncompliance
 - d. OSHA inspectors have arrived

- 2. Which of the following is not always appropriate if an employee fails to follow the steps of a JHA procedure?**
 - a. Discipline the employee
 - b. Discuss the situation with those who perform the job
 - c. Remind all employees of proper procedures
 - d. Review the JHA for improvement

- 3. To further improve the JHA and its related SJP, think about the _____ of the job.**
 - a. ergonomics
 - b. hazards
 - c. importance
 - d. priority

- 4. A solid JHA improvement process will make good use of the experience and knowledge of _____.**
 - a. an OSHA inspector
 - b. a supervisor and foreman
 - c. safety committees and other staff
 - d. workers and subject matter experts (SMEs)

5. Which of the following is not listed as a possible member of a JHA team?

- a. First line supervisors
- b. Experienced non-exempt employees
- c. Upper level managers
- d. Subject matter experts