This course is an introduction of the basic steps in an effective accident investigation that will help you to accurately determine the facts, understand injury analysis, surface-cause analysis, and root-cause analysis. You’ll learn why the goal is to discover weaknesses in the safety management system (SMS) that contribute to accidents.
OSHAcademy Course 162 Study Guide

Accident Investigation: Basic

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Contact OSHAcademy to arrange for use as a training document.

This study guide is designed to be reviewed off-line as a tool for preparation to successfully complete OSHAcademy Course 162.

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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Modules and Learning Objectives

Module 1: Gathering the Facts

Learning objectives in this module include:

- Discuss the concept of "accident investigation."
- Identify OSHA accident reporting requirements.
- List and describe at least five types of accidents, and those that are most common.
- Identify the basic elements of an effective accident investigation program.
- Describe the best practices for securing and documenting an accident scene.
- Describe important considerations for interviewing witnesses.
- Define "actor" and "action," and give an example of each in an event.
- Describe the process of developing a sequence of events leading up to the accident event.

Module 2: Analyzing the Facts

- Define "analysis" and give an example of a simple analysis process.
- Identify and describe the three primary phases of accident investigation cause analysis.
- Define "surface cause" and "root cause," and give examples of each.
- Describe possible short-term corrective actions that can be taken to correct surface causes.
- Describe possible long-term system improvements to correct safety management system weaknesses.
- Describe the five strategies, in order of priority, within the "Hierarchy of Controls."
• Discuss how to best "sell" management on the recommendations given as a result of the investigation.

• List and describe each of the five sections of the accident report.
Course Introduction

Workplace accidents occur each and every day all around the world. Accident investigations determine how safety management system weaknesses create hazardous conditions and unsafe behaviors, and develops solutions to prevent similar accidents from occurring. By using the information gained through an investigation, a similar or perhaps more disastrous accident may be prevented. We should always conduct accident investigations with accident prevention in mind rather than establishing blame.

The Challenge

The challenge to any accident investigator is to report the findings in a well-thought-out manner to ensure management will ultimately adopt recommendations for improving its safety management system, thus solving problems long-term. It's a common struggle trying to overcome long-held perceptions about safety and how accidents occur.

This course introduces you to basic accident investigation procedures that have proven effective. We will also take a look at various accident analysis techniques.
Module 1: Gathering the Facts

What is an Accident?

An accident is the final event in an unplanned process that results in injury or illness to an employee and possibly property damage. It is the final result or effect of a number of surface and root causes.

- An "event," occurs when one "actor" (one person/thing) performs an "action" (does something).

- A person or thing (equipment, tools, materials, etc.) will do something that results in a change of state.

- An accident may be the result of many factors (simultaneous, interconnected, cross-linked events) that have interacted in some dynamic way.

Reporting Accidents to OSHA

If your company is in the private sector, and a serious accident or fatality occurs, you may be required to report it to your State or Federal OSHA office.

OSHA Standard 1904.39, Reporting fatalities, hospitalizations, amputations, and losses of an eye as a result of work-related incidents to OSHA, details the specific requirements.

Basic Requirements

Within eight (8) hours after the death of any employee as a result of a work-related incident, you must report the fatality to the Occupational Safety and Health Administration (OSHA), U.S. Department of Labor.

Within twenty-four (24) hours after the in-patient hospitalization of one or more employees or an employee's amputation or an employee's loss of an eye, as a result of a work-related incident, you must report the in-patient hospitalization, amputation, or loss of an eye to OSHA.

Quiz Instructions

After each section, there is a quiz question. Make sure to read the material in each section to discover the correct answer to these questions. Circle the correct answer. When you are finished go online to take the final exam. This exam is open book, so you can use this study guide.
1. How soon must an employer report a work-related fatality to OSHA?

   a. Within 30 hours
   b. Within 24 hours
   c. Within 16 hours
   d. Within 8 hours

**Accident Types**

An accident isn't just an event that you can lump into one big category. In reality, there are many different types of accidents. Let's take a look at a partial list.

- **Struck-by**: A person is forcefully struck by an object. The force of contact is provided by the object.

- **Struck-against**: A person forcefully strikes an object. The person provides the force or energy.

- **Contact-by**: Contact by a substance or material that, by its very nature, is harmful and causes injury.

- **Contact-with**: A person comes in contact with a harmful substance or material. The person initiates the contact.

- **Caught-on**: A person or part of his/her clothing or equipment is caught on an object that is either moving or stationary. This may cause the person to lose his/her balance and fall, be pulled into a machine, or suffer some other harm.

- **Caught-in**: A person or part of him/her is trapped, or otherwise caught in an opening or enclosure.

- **Caught-between**: A person is crushed, pinched or otherwise caught between a moving and a stationary object, or between two moving objects.

- **Fall-to-same-surface**: A person slips or trips and falls to the surface he/she is standing or walking on. This is the second-most common accident causing injuries in the workplace.

- **Fall-To-below**: A person slips or trips and falls to a level below the one he/she was walking or standing on. This is the third-most common accident in the workplace (NSC).
• **Overexertion:** A person over-extends or strains himself/herself while performing work. This is the most common accident in the workplace (NSC).

• **Bodily reaction:** Caused solely from stress imposed by free movement of the body or assumption of a strained or unnatural body position. A leading source of injury.

• **Over-exposure:** Over a period of time, a person is exposed to harmful energy (noise, heat), lack of energy (cold), or substances (toxic chemicals/atmospheres).

2. According to the National Safety Council (NSC) this is the most common accident type in the workplace.

   a. Falls-to-same-surface
   b. Bodily reaction
   c. Overexertion
   d. Falls-to-below

**Effective Accident Investigation Program**

An effective accident investigation program will be guided by standard written procedures. It's important to make sure procedures are clearly stated and easy to follow in a step-by-step fashion. The effective program will include the following elements:

• **Joint Investigation:** Usually a supervisor, safety manager, or management/labor team conducts the investigation. Usually, two heads work better than one, especially when gathering and analyzing material facts about the accident. We recommend a team approach.

• **Training:** All accident investigators will be formally trained on accident investigation techniques and procedures.

• **Fact-Finding vs. Fault-Finding:** The accident investigation must be perceived as separate from any potential disciplinary procedures resulting from the accident. The purpose of the accident investigation is to get at the facts, not find fault. The accident investigator must be able to state with all sincerity, that he or she is conducting the investigation only for the purpose of determining cause, not blame.

• **Recommendations:** The accident investigation report will make recommendations to correct hazardous conditions, work practices, and those underlying contributing factors that allowed them to exist. In many instances, the surface causes for the accidents are
corrected on the spot, and will be reported as such. But the investigator must make recommendations for long-term corrections in the safety and health system to make sure those surface causes do not reappear.

- **Formal Report:** The accident investigation report will be in writing and will make sure that the surface causes and root causes of accidents are addressed. Most accident reports are ineffective precisely because they neglect to uncover the underlying reasons or factors that contribute to the accident.

- **Follow-up:** Assignment of responsibilities and follow-up procedures to make sure short and long-term corrective actions are completed.

- **Review:** An annual review of accident reports. A couple of safety committee members evaluate accident reports for consistency and quality. They must make sure root causes are being addressed and corrected. Information about the types of accidents, locations, trends, etc., can be gathered.

### 3. What is the purpose of an accident investigation?

- To determine legal liability
- To find facts, not fault
- To prevent OSHA investigations
- To establish who is at fault

**The Six Step Investigation Process**

The accident investigation process we will discuss in this course will make sense if you understand that ultimately, the purpose of the investigation is to improve the safety management system. Conducting the investigation for any other reason will likely result in ineffective solutions. In this course, we'll introduce a six-step process for conducting accident investigations.

**Step 1: Secure and Document the Accident Scene**

*Securing the Scene*

The first step in an effective accident investigation procedure is to secure the accident scene as soon as possible so that we can accurately gather facts. At this point, you are not yet interested in what "caused" the accident. Instead, you should focus on making the accident scene secure so that you can gather as much pertinent information as possible.
To secure the accident scene, simply use yellow caution tape, place warning cones, or post a guard to keep people away.

**Starting the Investigation**

Don't start documenting the scene until it is safe to do so. As the accident investigator, you don't want to get in the way of emergency responders. It's also not safe to start if hazards have not been properly mitigated.

4. **When should the accident investigation be initiated?**
   - a. Within 8 hours of the accident
   - b. Immediately after the event
   - c. When it is safe to do so
   - d. When OSHA requires it

**Documenting the Accident Scene**

Once the accident scene has been roped off, it's important to immediately begin gathering evidence from as many sources as possible during an investigation. You want to gather data that will help you determine what happened, how it happened, and why it happened.

You won't be able to document the scene effectively unless you come prepared, so make sure you have put together an [accident investigation kit](#) for use during the investigation. As you'll learn, there are many ways to document the scene, so it may become quite difficult for one person to effectively complete all actions.

The most effective strategy is to document as much as possible, even if you don't think the information may be relevant. It's easy to discard clues or leads later if they prove to not be useful to the investigation. It's not at all easy to dig up material evidence late into the investigation.

- **Make personal observation:** With clipboard in hand, take notes on personal observations. Try to involve all of your senses (sight, hearing, smell, etc.).
- **Get initial written statements:** If you are fortunate, there will be one or more eyewitnesses to the accident. Ask them for an initial statement giving a description of the accident.
- **Take photos and videos:** When taking photos, make sure you start with distance shots, and gradually move in closer as you take the photos. Take photos from different angles.
Use rulers to size objects. Identify what is being photographed. When taking video, try to get witnesses to describe what happened.

- **Sketch the scene:** Sketches are very important because they compliment the information in photos, and are good at indicating distances between the various elements of the accident. This is important to do because it establishes "position evidence." It is important to be as precise as possible when making sketches. The sketch to the right illustrates the Triangulation Method which makes it possible to later pinpoint the exact location of an object. Notice the small circles with horizontal lines through them. These circles indicate where photos were taken. Also, North is indicated and all major objects are identified.

- **Interview records:** That's right. Don't just review the records. Ask questions and they will give you answers. Records include training records, preventive/corrective maintenance reports, Job Hazard Analyses, standard operation procedures, work schedules, and previous hazard reports, etc.

5. Each of the following activities is part of documenting the accident scene, EXCEPT _____.
   a. placing warning tape around the accident scene
   b. making personal observations
   c. taking initial written statements
   d. taking photographs and video

**Step 2: Interview Witnesses**

After you have initially documented the accident scene, the next step is to start digging for additional details by conducting interviews. This activity is perhaps the most difficult part of an investigation. The purpose of the accident investigation interview is to obtain an accurate and comprehensive picture of what happened. Remember, you're conducting an accident
investigation, not a criminal investigation. The last thing to do in the interview is to come down hard (be accusatory) on an interviewee.

So let's take a look at some effective techniques that will assure you get the facts. An important aspect of your job, as the interviewer, is to construct a composite story or "word picture" of what happened using the various accounts of the accident and other evidence. So, let's review some effective interviewing techniques:

- Tell the interviewee the purpose of the interview is to get facts, not place blame.
- Do not interview more than one person at a time. The facts change when others are listening.
- Ask for background information. Then, simply have the witness tell you what happened. Let them talk, and you just listen.
- Don't ask them "if" they can explain what happened, because they may respond with a simple "no," and that's that.
- Go to the scene to interview if you can. If you can't, find an office or meeting room that the interviewee considers a "neutral" location.
- Put the person at ease. Explain the purpose and your role. Sincerely express concern regarding the accident and desire to prevent a similar occurrence.
- Be friendly, understanding, and open minded. Be calm and unhurried.
- Don't ask leading questions; don't interrupt; and don't make expressions (facial, verbal of approval or disapproval).
- Do ask open-ended questions and avoid closed-ended questions that require a simple yes and no answer.
- Avoid asking "why-you" questions as these type of questions tend to make people respond defensively.
- Repeat the facts and sequence of events back to the person to avoid any misunderstandings.
- Take notes. Let the individual read your notes so that they can correct inaccuracies.
• Don't record the interview unless you get permission.

• If the interviewee wants to have someone witness the interview, that's fine.

• Ask for the interviewee's opinion about what can be done to prevent another accident.

• Thank the interviewee and ask them to contact you if they think of anything else that might be helpful.

6. What is the purpose of the accident investigation interview?

   a. To establish who is primarily at fault
   b. To determine the degree of involvement of the interviewee
   c. To get an accurate picture of what happened
   d. To determine extent of injuries and damage to equipment

Step 3: Conduct Event Analysis

So far, you have collected a lot of factual data and it's strewn all over your desk. The task now is to turn that data into useful information. You've got to somehow take this data and make some sense of it.

Assessment vs. Analysis

It's important to know that you're not gathering all of this information just to conduct an assessment of what was and was not present immediately prior to the accident. You're actually conducting an analysis to determine specifically how surface causes (behaviors and conditions), and the underlying root causes (system weaknesses) contributed to the accident. To better understand this, let's take a closer look at what the process of "analysis" is.

Analysis Defined

Webster defines analysis as the, "separation of an intellectual or substantial whole into its parts for individual study."

The accident is a complicated process of individual events leading up to and including the main event. When an accident occurs, we need to separate or "break down" the "whole" accident into its component "parts" for study to determine how they contributed to the accident: the main event.

The accident investigator's challenge is to effectively assess each event to identify the presence or absence of behaviors and conditions, and then analyze those behaviors and conditions in
each event to determine if and how they contributed to the accident. To do this we need to make some basic assumptions about the factors that cause or contribute to accidents.

7. What is the definition of analysis?

- Assessing the need for improvements in processes
- Judging the effectiveness of a process or procedure
- Separating the whole into its individual parts for study
- Determining how the whole contributes to its individual parts

Analyzing Each Event

In developing a sequence of events, the challenge is to take the information gathered and arrange it so that we can accurately determine what initial conditions and/or actions transformed the planned work process into an unintended accident process.

The Two Components of an Event: The Actor and the Action

Each event in the unplanned accident process is composed of an actor and an action, so let's take a look at each.

1. **Actor:** The actor is an individual or object that directly influenced the flow of the sequence of events. An actor may participate in the process or merely observe the process. An actor initiates a change by performing or failing to perform an action.

2. **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. Failure to act should be thought of as an act, just as much as an act that is accomplished.

It's important to understand that when describing an event in writing, first identify the actor and then tell what the actor did. Remember, the actor is the "doer," not the person or object being acted upon or otherwise having something done to them. For instance, take a look at the event statement below:

"Bob unhooked the lifeline from the harness."

In the example above, "Bob" is the actor and "unhooked" describes the action. First we describe the actor...Bob. Next, we describe the action...unhooking. The lifeline and harness, although "objects" are not actors because they are not performing an action. Rather, something is being done to them. Also note that the statement is written in active tense.
8. Each event in the sequence of events leading up to an accident will contain _____.
   a. a combination of actors and events
   b. one actor and one action
   c. actors and related events
   d. actors, actions, and consequences

Developing the Sequence of Events

Our challenge at this point in the investigation process is to accurately arrange the events to determine their correct sequence leading up to the accident so that we can more effectively understand why the accident event, itself, happened. Once the sequence of events is developed, we can then study each event in the sequence to determine the related causal factors below.

- **Hazardous conditions**: Objects and physical states that directly caused or contributed to the accident.

- **Unsafe behaviors**: Actions taken/not taken that directly caused or contributed to the accident.

- **System weaknesses**: Underlying inadequate or missing policies, programs, plans, processes, procedures and practices that contributed to the accident.

Sample Sequence of Events

To get a good idea of what the sequence of events looks like, review the short example below:

1. At approximately 12:45 PM employee #1 began dumping accumulated sand from an irrigation mainline pipe.

2. Employee #1 oriented the pipe vertically and it contacted a high voltage power line directly over the work area.

3. Employee #2 heard a 'zap' and turned to see the pipe falling and employee #1 falling into an irrigation ditch.

4. Employee #2 ran to employee #1 and pulled him from the irrigation ditch.
5. Approximately one minute later, paramedics arrived and began to administer CPR on employee #1.

6. At approximately 1:10 PM an ambulance arrived and transported employee #1 to the hospital where he was pronounced dead at 1:30 PM.

9. What must be completed before the accident investigator can analyze events to determine surface and root causes?

   a. Only keep those events that establish liability
   b. Determine the total number of events
   c. Accumulate all relevant events
   d. Arrange events into their proper sequence

Sample Sequence of Events

Look at the image below to see how you can use cards to visually develop the sequences of events. Describe each single event on the front of the card and any additional source information on the back. Each card will indicate the actor and action. Attach any photos you take to the card. Arrange the cards on your desk or a wall in the proper sequence.
Construct One Event Only

If an event is hard to understand, it may be that the description is too vague or general. The solution to this problem is to increase the detail. We can use two strategies to increase detail:

- **Look around:** Determine if anything else was said/done before or after the event you're currently assessing.

- **Separate the actors:** Remember, an actor may be a person or a thing accomplishing a given action. If an event includes actions by more than one actor, break the event down into two events. If the event contains the conjunction, "and," the event is likely to be a combination of two events. If you look at the sample sequence of the events from 5.9 and 5.10, I'm sure you can spot a few combined events.

Well, that was a short, but informative, introduction to the idea of constructing the sequence of events. Just remember, the accuracy of your investigation will be greater by following this procedure.

10. What is a clue that you have included too much information in an event?

   a. All actions are stated in the past tense
   b. The event description is too long
   c. The event includes multiple actors or actions
   d. The actor and action are not directly related
Module 2: Analyzing the Facts

Step 4: Conduct Cause Analysis

You've completed the initial step of the accident analysis by gathering information and using it to break the accident down into an accurate sequence of events. You have a good mental picture of what happened. Now it's time to continue the analysis process by completing each of the following three phases of analysis to determine what caused those events. This module will introduce us to three phases of analysis:

- **Phase 1: Injury Analysis:** It's important to understand, we're not analyzing the accident in this phase: we are analyzing precisely what happened during the accident event to identify the type of harmful energy involved (electrical, mechanical, thermal, etc.) and how the harmful transfer of this energy (an action) caused the injury or illness. Remember, the outcome of the accident process is an injury or illness.

- **Phase 2: Surface Cause Analysis:** In this next phase in the analysis process, you determine how the hazardous conditions and unsafe behaviors described in each of the events interact to produce the accident. The hazardous conditions and unsafe behaviors uncovered are the surface causes for the accident and give clues that point to possible system weaknesses.

- **Phase 3: Root Cause Analysis:** During this phase of the analysis process, you're analyzing the weaknesses in the Safety Management System SMS that contributed to the accident. You can usually uncover weaknesses related to inadequate safety policies, programs, plans, processes, or procedures. Root causes always pre-exist surface causes and may function through poor component design to allow, promote, encourage, or even require systems that result in hazardous conditions and unsafe behaviors.

We'll cover each of these three phases of analysis in more detail in the next few sections.

1. In which phase of cause analysis, do we want to know what system weaknesses contributed to the accident?
   a. Injury cause analysis
   b. Surface cause analysis
   c. Root cause analysis
   d. Stem cause analysis
Phase 1: Injury Analysis

It's important to understand all injuries to workers are caused by one thing: the harmful transfer of energy. Let's take a look at some examples that illustrate this important principle.

- If a harsh acid splashes on your face, you may suffer a chemical burn because your skin has been exposed to a chemical form of energy that destroys tissue. In this instance, the **direct cause of the injury** is a harmful **chemical reaction**. The related surface causes might be the acidic nature of the chemical (condition) and working without proper face protection (unsafe behavior).

- If your workload is too strenuous, force requirements on your body may cause a muscle strain. Here, the direct cause of injury is a harmful level of **kinetic energy** (energy resulting from motion), causing injury to muscle tissue. A related surface cause of the accident might be fatigue (hazardous condition) or improper lifting techniques (unsafe behavior).

In the next section, we'll take a closer look at each of the types of energy that might cause injury.

The important point to remember here is the "direct cause" of the injury is not the same as the "surface cause" of the accident event.

- The **direct cause of injury** is the harmful transfer of energy as a consequence of your exposure to that energy. The direct result of the harmful energy transfer is injury. The **cause** is the harmful transfer of energy. The **effect** is the injury.

- The **surface cause of the accident** is the condition and behavior that interacts in a way that results in the harmful transfer of energy. The interaction of the condition and behavior is the cause. The effect is the harmful transfer of energy.

2. The direct cause of injury or illness is always _____.
   a. the result of a general lack of common sense
   b. the harmful transfer of energy
   c. a hazardous condition
   d. an unsafe behavior
Phase 2: Surface Cause Analysis

In the last module, you learned that each event in our sequence will include an actor and an action that may have contributed to the accident. Once we have identified the actors and actions in the sequence of steps, our next job is to analyze each event to determine the surface causes for the accident.

What are Surface Causes?

The surface causes of accidents are those hazardous conditions and unsafe or inappropriate behaviors within the sequence of events that have directly caused or contributed in some way to the accident. It's important to understand that surface causes describe unique conditions or individual behaviors.

A hazardous condition is characterized by the following:

- a unique tool, piece of equipment, or machinery, etc., that is not properly guarded or somehow defective
- an employee's "state of being" such as fatigue or being distracted
- may also be a unique defect in a process, procedure or practice
- may exist at any level of the organization
- is the result of deeper root causes

Unsafe or Inappropriate Behaviors are characterized by:

- taking an intentional/unintentional action that is unsafe or failure to take an action that is safe
- a unique performance error in a process, procedure or practice
- may exist at any level of the organization
- are the result of deeper root causes

It's important to know most hazardous conditions in the workplace are the result of the unsafe or inappropriate behaviors that produced them.
3. Which of the following is an example of a surface cause for an accident?

   a. Inadequate safety inspections
   b. A lack of safety supervision and leadership
   c. A defective piece of equipment
   d. Inadequate safety training program

Phase 3: Root Cause Analysis

The root causes for accidents are the underlying SMS weaknesses that consist of thousands of variables, any number of which can somehow contribute to the surface causes of accidents. This level of investigation is also called "common cause" analysis (in quality terms) because you’re identifying a system component that may contribute to common conditions and behaviors that exist or occur throughout the company. These weaknesses can take two forms.

- **SMS Design Root Causes**: Inadequate design of one or more components of the safety management system. The design of safety management system policies, plans, programs, processes, procedures and practices is very important to make sure appropriate conditions, activities, behaviors, and practices occur consistently throughout the workplace. Design root causes describe the "condition" of the SMS, and ultimately, they contribute to most accidents.

- **SMS Performance Root Causes**: Inadequate implementation of one or more components of the SMS. After each SMS component is designed, it must be effectively carried out or implemented. Performance root causes describe the "behavior" of the SMS. You may design an effective safety plan, yet suffer failure because it wasn’t implemented properly. On the other hand, if you effectively implement a poorly designed component, you’ll get the same results: inadequate system performance.

Ultimately, for the SMS to be effective, both the design and implementation must be effective.

4. Which of the following is an example of an safety management system (SMS) design root cause?

   a. Failure of employees to respond properly when fire alarms sound
   b. A failure to assemble properly during a fire drill
   c. No written emergency action plan or fire prevention plan
   d. Employees are unfamiliar with how to use fire extinguishers
Assume the SMS Failed

When conducting an accident investigation, a basic assumption should be that somehow the SMS has failed. The investigation will either verify this assumption, or prove it wrong. Most of the time, it will be verified. Why is that? Most accidents in the workplace result from unsafe work behaviors.

- unsafe behaviors are the primary surface cause for the vast majority of all workplace accidents;
- hazardous conditions are the primary surface cause for a small percentage of workplace accidents; and
- uncontrollable (unknowable) "acts of God" account for the remaining very small percentage.

These statistics imply that, because SMS weaknesses contribute in some way to workplace hazardous conditions and unsafe behaviors, those weaknesses are ultimately responsible for almost all workplace accidents. So, the basic assumption should be that, ultimately, most accidents are the result of SMS weaknesses, not unsafe behaviors or hazardous conditions.

To effectively fulfill your responsibilities as an accident investigator, you must not close the investigation until these root causes and solutions have been identified.

5. Accident investigators should assume that most accidents are caused by _____.
   a. unsafe behaviors
   b. hazardous conditions
   c. system weaknesses
   d. lack of common sense

Step 5: Recommend Corrective Actions and System Improvements

In this step we propose recommendations that include effective immediate corrective actions and system improvements that, when applied effectively, can transform the investigation into valuable "proactive" process that helps to prevent future injuries. It's important to divide your recommendations into the categories below:
1. **Immediate or short-term corrective actions** to eliminate or reduce the hazardous conditions and/or unsafe behaviors related to the accident.

2. **Long-term system improvements** to create or revise existing safety policies, programs, plans, processes, procedures and practices identified as missing or inadequate in the investigation.

Some employers may assign the responsibility for making recommendations to safety directors or other managers. However, you, as the accident investigator, may be required to take on this very important responsibility. Consequently, it's a good idea to know where to start, and how to write strong recommendations.

One tip up front: If you find the responsibility is yours, be sure to get the help of experts if you are unsure how to proceed. OSHA consultants, other safety professionals or your workers' compensation insurer can be a great source for help.

6. An effective recommendation will include _____ corrective actions and _____ system improvements.

   a. common sense; engineering
   b. feasible; reasonable
   c. primarily; additional
   d. short-term; long-term

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**The Hierarchy of Controls**

Safety professionals recognize several primary control strategies to eliminate or reduce health hazards and employee exposure to those hazards. These basic control strategies are further organized into a "Hierarchy of Controls." ANSI/ASSP Z10-2012, Occupational Health and Safety Management Systems, encourages employers to use the following hierarchy of hazard controls when making recommendations for corrective actions and system improvements:
Hazard Control Strategies

The first three areas attempt to control hazards and the bottom two strategy areas try to change exposure to hazards. Controlling hazards is always preferred to controlling behavior, and that's why these strategies are at the top of the hierarchy.

1. **Elimination** - removes the source of the hazard. This strategy totally eliminates the hazard from the workplace.

2. **Substitution** - reduces the hazard. This strategy should be used if it is not feasible to eliminate the hazard. The idea is to replace the hazard with a less hazardous substitute.

3. **Engineering controls** - isolate the hazard through design. This strategy involves the design or redesign of tools, equipment, machinery and facilities so that hazardous chemicals are not needed or that exposure to those hazardous chemicals are not possible. Examples include enclosing work processes or installing local ventilation systems.

Exposure Control Strategies

These strategies attempt to control employee behaviors to eliminate or reduce exposure to existing health hazards when hazard controls are not adequate. Naturally it's more difficult to control behaviors than hazards because we're dealing with human behavior.

4. **Warnings** - raise awareness through by using signs, alarms, signals, labels, placards, cones, and other methods. For example, a warning sign might be used to keep workers from entering a confined space.

5. **Administrative/work practice controls** - eliminate/reduce exposure to hazards. This strategy helps to reduce exposure by developing and implementing effective training,
policies, processes, procedures, practices and safety rules. This strategy really gets to the root causes by making recommendations to improve system weaknesses.

6. Personal Protective Equipment (PPE) - eliminates/reduces exposure through personal barriers. This strategy is generally used in conjunction with the other strategies to reduce exposure. When effective elimination, substitution and engineering controls are not feasible appropriate PPE such as gloves, safety goggles, helmets, safety shoes, and protective clothing may be required. To be effective, PPE must be individually selected, properly fitted and periodically refitted; conscientiously and properly worn; regularly maintained; and replaced as necessary.

It's important to note that administrative/work practices controls and personal protective equipment are the primary control strategies used by IHs to control exposure to health hazards in the workplace.

7. Which of the following control measures is considered the highest priority in the "Hierarchy of Controls?"

   a. Administrative controls
   b. Engineering controls
   c. Elimination
   d. Personal protective equipment

"Selling" Safety

You must "sell" management on the benefits of approving your recommendations. To most effectively do that, emphasize the bottom line - how they will benefit financially. Educate management on the direct and indirect accident cost savings realized if your recommendations are approved.

Direct and Indirect Cost Savings: Indirect costs can be over four times direct costs when an accident occurs. To help management understand the bottom-line financial benefits from approving recommendations, emphasize the financial benefits. The most common way of doing this is to estimate the direct and indirect cost savings.

- Direct costs include workers' compensation payments, medical expenses, and costs for legal services.
- **Indirect costs** include training replacement employees, accident investigation and implementation of corrective measures, lost productivity, repairs of damaged equipment and property, and costs associated with lower employee morale and absenteeism.

**OSHA's Safety Pays** software is an excellent tool that estimates direct and indirect accident costs. It also calculates the business volume required to cover those costs. The data is based on 52,000 lost-time claims submitted to a major workers compensation insurance carrier.

**Provide Options**

Another good recommendation strategy is to provide the decision-maker with alternative corrective actions. This will increase the probability that the decision-maker will choose one of the alternatives. Your options might follow the logic below:

1. **First option** -- If we had all the money we needed, what could we do? Eliminate the hazard with primarily engineering controls. Additional administrative controls if required.

2. **Second option** -- If we have limited funds, what would we do. Eliminate the hazard with primarily administrative controls. Engineering controls if required.

3. **Third option** -- If we don't have any money, what can we do? Reduce exposure to the hazard with administrative controls and/or PPE.

**8. What should you emphasize to improve the chances of getting your recommendations for corrective actions and system improvements approved by management?**

   a. Improvement in processes and procedures  
   b. Increased employee morale and discipline  
   c. Direct and indirect cost savings  
   d. Protection from OSHA inspections

**Step 6: Write the Report**

Now that you have accurately assessed and analyzed the facts related to the accident and developed effective corrective actions and system improvements, you must report your findings to those who have the authority to take action.
The Accident Report Form

One of the most common reasons an accident investigation might fail to fulfill its intended purpose of helping to eliminate similar accidents, is that the report form is poorly designed. They actually make it difficult to get beyond identification of only surface causes: root causes are often ignored. Consequently, system improvements are not recommended.

Let's take a look at one format that is designed to emphasize root cause analysis. Take a look at a sample accident report. This is a report format similar to that used by OSHA accident investigators in conducting workplace accident investigations, but it goes further. This form includes the identification of safety management system weaknesses and recommended improvements. You may want to print this form while we discuss the various sections.

Section I. Background

This section contains background information that answers questions about who the victim is, and the time, date, location of the accident, as well as other necessary details. Make sure you obtain all of this information for possible later reference.

Section II. Description of the Accident

This section presents a descriptive narrative of the events leading up to, including and immediately after the accident. It's important that the narrative paint a vivid "word picture" so that someone unfamiliar with the accident can clearly see what happened.

Take a look at a sample Section II Description of the accident.

9. What is one of the most common reasons accident reports fail to achieve their intended purpose?
   a. Too many recommendations
   b. Failure to recommend system improvements
   c. Recommendations are not reasonable
   d. Failure to submit the report

Section III. Findings

The findings section describes the hazardous conditions, unsafe behaviors and the system weaknesses your analysis has uncovered. Each description of a surface or root cause will also include justification for the finding. The justification will explain how you came to your conclusion.
Unfortunately, the **most common** failure found in accident reports is they address only surface causes. Consequently, similar accidents recur. These report forms may have a format that "forces" the investigator to list only surface causes for accidents. The form does not "report" the system weaknesses associated with each surface cause. Consequently, the investigator believes the job is done without ferreting out the system weaknesses representing the root causes.

Other forms may actually require the investigator to indicate the status of employee negligence. Now, how can the accident investigator assure an interviewee or any other employee that the purpose of the analysis process is to "fix the system -- not the blame," when the report form shouts "negligent"?

To complete this section, just state the facts: The hazardous conditions, unsafe behaviors, practices, and inadequate or missing programs, policies, plans, processes and procedures that produced them. Be sure to write complete descriptive sentences. Not short cryptic phrases.

Take a look at this sample **Section III: Findings and Justifications**.

**Section IV. Recommendations**

If root causes are not addressed properly in Section III of the report, it is doubtful recommendations in this section will include improving system inadequacies. Effective recommendations will describe ways to eliminate or reduce both surface and root causes. They will also detail estimated costs involved with implementing corrective actions. Let’s take a closer look at effective recommendation writing. Review this sample **Section IV: Recommendations**.

**Section V. Summary**

This section contains a brief review of the causes of the accident and recommendations for corrective actions. In your review, it's important to include language that contrasts the costs of the accident with the benefits derived from investing in corrective actions. Including bottom-line information will ensure that your recommendation will be understood and appreciated by management. Remember, it's never appropriate for the accident investigator to recommend disciplinary action. Disciplinary action should be considered only by managers and only after very careful consideration of all of the facts. By the way, if system weaknesses that contributed to the accident are identified, discipline is likely unnecessary.

**Open document**: The accident investigation report should be considered an open document until all recommendations have been addressed.
10. Which of the following is not appropriate in an accident investigation report?

   a. An estimate of the costs of system improvements
   b. Assignment of corrective action responsibilities
   c. Recommended disciplinary action
   d. Timelines for corrective action and system improvements
Additional Resources

1. OSHA eTool Matrix, OSHA
2. OSHA Safety Pays, OSHA
3. Foundation for a Safe Workplace, Oregon OSHA
4. ANSI/AIHA Z10-2012, American National Standards Institute
5. Accident Investigation Stories, Washington State Department L&I