Effective Accident Investigation
OSHAcademy Course 702 Study Guide

Effective Accident Investigation

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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 702.

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:

OSHAcademy
15220 NW Greenbrier Parkway, Suite 230
Beaverton, Oregon 97006
www.oshatrain.org
instructor@oshatrain.org
+1.888.668.9079

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Course Introduction

Workplace accidents occur each day all across the country. Each year the Bureau of Labor Statistics publishes a statistical summary of injuries and illnesses (See summary below) that emphasizes this fact.

The failure of people, equipment, supplies, or surroundings to behave or react as expected causes most of the accidents. Accident investigations determine how and why these failures occur. By using the information gained through an investigation, a similar or perhaps more disastrous accident may be prevented. Conduct accident investigations with accident prevention in mind. Investigations are NOT to place blame.

National Census of Fatal Occupational Injuries in 2015

The overall incidence rate of nonfatal occupational injury and illness cases requiring days away from work to recuperate was 104.0 cases per 10,000 full-time workers in 2015, down from 107.1 cases in 2014. In 2015, there were 1,153,490 days-away-from-work cases in private industry, state government, and local government - essentially unchanged from the number of cases reported in 2014. The median days away from work to recuperate - a key measure of severity of injuries and illnesses - was 8 days in 2015, 1 day fewer than reported in 2014.

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.

What is the purpose of this course?

This course introduces you to basic accident investigation procedures that have proven effective. We will also take a look at various accident analysis techniques. Throughout the course, you'll be taking what you've learned to analyze a hypothetical accident!
Module 1: The Basics

The best metaphor for how accidents are investigated is a simple maze. If a group of people are asked to solve the maze as quickly as possible and ask the "winners" how they did it, invariably the answer will be that they worked it from the Finish to the Start. Most mazes are designed to be difficult working from the Start to the Finish, but are simple working from the Finish to the Start. Like a maze, accident investigations look backwards. What was uncertain for the people working forward through the maze becomes clear for the investigator looking backwards. (Source: DOE)

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.

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-surface.** A person slips or trips and falls to the surface he/she is standing or walking on.

-**Fall-To-below.** A person slips or trips and falls to a level below the one he/she was walking or standing on.

-**Over-exertion.** A person over-extends or strains himself/herself while performing work.

-**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).

**Are accidents always unplanned?**

We like to think that accidents are unexpected or unplanned events, but sometimes, that's not necessarily so. Some accidents result from hazardous conditions and unsafe behaviors that have been ignored or tolerated for weeks, months, or even years. In such cases, it's not a question of "if" the accident is going to happen: It's only a matter of "when." But unfortunately, the decision is made to take the risk.

A competent person can examine workplace conditions, behaviors and underlying systems to predict closely what kind of accidents will occur in the workplace. Technically, we can't say an accident is always unplanned. Like any system, a safety management system is designed perfectly to produce what it produces. Consequently, written safety plans may be (unintentionally) designed such that they create circumstances that cause accidents.

In companies that decide to take the risk, it's likely their attitude about accidents is that, "accidents just happen; there's nothing we can do about them." Of course, that's an unacceptable notion in any effective safety culture. Employers with a healthful attitude about accidents consider them to be "inexcusable," and demand that hazards be corrected before they cause an accident.
Old Theory - Worker Error

Old thinking about the causes of accidents assumes that the worker makes a choice to work in an unsafe manner.

It implies that there are no outside forces acting upon the worker influencing his actions and that there are simple reasons for the accident. Old thinking also considers accidents as solely resulting from worker error: A lack of "common sense." Actually, common sense is an invalid concept. No one has common sense. Rather, we each develop a unique and hopefully "good sense" based on individual experience, education, etc. Assuming common sense also allows management to more easily place blame for accidents squarely on the shoulders of the employee. The employee is "the problem." So, to prevent accidents, the employee must work more safely. This thinking results in blaming and short-term fixes that are inefficient, ineffective, and in the long run more expensive to implement and maintain.

Why Conduct the Accident Investigation (AI)

Why should you conduct an accident "investigation"? The answer to this question is key to the success of the entire AI process. Here’s an important principle to understand:

To determine the purpose of a process, look at the final "output" of that process.

What does that mean? It means that to understand what the purpose of the accident investigation process is, you’ve got to look at the findings in the final report. So, let’s contrast the findings in an OSHA AI report with what should be the findings in your AI report.

Why OSHA Conducts an Accident Investigation

As you are surely aware, OSHA conduct many accident investigations each year. You can review accident summaries at the OSHA Fatality and Catastophe Investigation Summaries webpage.

Remember, the findings in investigation report is the output of the investigation process, so let’s take a look at the sample given in OSHA Instruction CPL 2.113, Appendix C:
MEMORANDUM FOR: Regional Administrator  
FROM: Area Director  
SUBJECT: Notification of Results of Fatality Investigation  

The following information supplements the OSHA-170, regarding investigation of the accident at _____ Company, Inc., which occurred on June 15, 1995.

Establishment Information: _____ Company, Inc., located at Grainfield Road, Grossfield, USA, has no previous inspection history. The company has a workforce of 32 employees and operates on a seasonal basis, usually June to November.

Family Involvement: The next of kin information was obtained from the company and the CSHO telephoned to verify the information and advise the family that an investigation is in progress. The standard information letter was sent. There has been no further contact from the family.

Union Involvement: There is no union at this location.

Proposed Action: (The output!) Issue citations for serious and other violations of machine guarding, open floor holes, hazard communication and recordkeeping with a penalty total of $5,475. A 5(a)(1) letter outlining the hazards to be corrected which were not clearly addressed by 29 CFR 1928 Safety and Health Standards for agriculture and for which other OSHA Standards are not applicable will also be mailed to the company.

The six month date for this case is December 15, 1995.

As you can see, the output was a recommendation to cite and fine the employer. The message in the above OSHA report is that, as required by the OSHA Act of 1970, OSHA conducts accident investigations to primarily determine if the employer violated OSHA standards. OSHA establishes employer liability, places blame, and administers "penalties" (punishment). This is OSHA's mandate: Establish liability and issue penalties as appropriate.

This is not your organization's mandate... Read on...

The employer's mandate: Investigate and analyze to fix the system... not the blame...
Unfortunately, some employers believe that the investigation process ends once the blame has been established. The problem, however, is that **once the purpose of the analysis process has been achieved, analysis stops.** When employers investigate to place blame, effective analysis to fix the system does not generally occur.

According to OSHA's Safety & Health Program Management Guidelines, the employer's primary purpose for investigating accidents is primarily, "**so that their causes and means for preventing repetitions are identified.**"

OSHA goes on to say this about the investigation process:

"**Although a first look may suggest that 'employee error' is a major factor, it is rarely sufficient to stop there.** Even when an employee has disobeyed a required work practice, it is critical to ask, "Why?" A thorough analysis will generally reveal a number of deeper factors, which permitted or even encouraged an employee's action. Such factors may include a supervisor's allowing or pressuring the employee to take short cuts in the interest of production, inadequate equipment, or a work practice which is difficult for the employee to carry out safely. An **effective analysis will identify actions to address each of the causal factors in an accident or 'near miss' incident.**"

**Bottom line.** The output of the employer's accident investigation process should not end with merely identifying violations of employer safety rules. The end product should identify the root causes: the safety management system weaknesses. In the most effective employer accident investigations, the question of liability (fault, blame) should be addressed only if an honest post-investigation evaluation concludes that no safety management system weaknesses contributed to the accident.

**Characteristics of an effective accident investigation program**

- The 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.
- Clearly assigned responsibility for accident investigation. It's up to the employer to determine who conducts accident investigations. Usually a supervisor, management/labor team, or safety committee member conducts the investigation. Whoever conducts the investigation needs to understand his or her role as an accident investigator. Usually, two heads work better than one, especially when gathering and analyzing material facts about the accident. We recommend a team approach.
- All accident investigators will be formally trained on accident investigation techniques and procedures. Investigators may attend accident investigation training presented by OSHA, private educational institutions, or in-house training conducted by a qualified person.
• 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.

• 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. Only by digging deep, can you eliminate the hazardous conditions and work practices that, on the surface, caused the accident.

• The accident investigation report will make recommendations to correct hazardous conditions and 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.

• Follow-up procedures to make sure short and long-term corrective actions are completed.

• 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.
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. According to the text, an accident is the _______ in _______ process.
   a. end result, a planned
   b. final event, an unplanned
   c. expected outcome, an unsafe
   d. unexpected happening, a hazardous

2. Accidents are usually caused by a lack of common sense.
   a. True
   b. False

3. The employer's mandate when conducting accident investigations is to investigate to _______.
   a. determine fault, not the cause
   b. fix the fault to establish accountability
   c. fix the system, not the blame
   d. any of the above is a valid mandate

4. Employers with a healthful attitude about accidents consider them to be excusable.
   a. True
   b. False

5. Which of the following are characteristics of an effective accident investigation program?
   a. standard written procedures
   b. investigators will be formally trained
   c. surface causes for the accidents are corrected on the spot
   d. all of the above
Module 2: Initiating the Investigation

Why conduct the investigation?

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. If you conduct the investigation for any other reason, it will likely result in ineffective solutions.

In this module, we'll discuss a six-step process for conducting accident investigations.

- Secure the accident scene
- Conduct interviews
- Develop the sequence of events
- Conduct cause analysis
- Determine the solutions
- Write the report

Let's get started!

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.

When should you secure the accident scene?

That's a good question, and the basic answer is that you should begin when 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.

Why secure the accident scene?

That's a good question. It's always important to know why we are doing something, isn't it? In this situation, we need to prevent material evidence from being removed or relocated in some way. This is especially true if the accident is a reportable
(serious or fatal) injury that might trigger an OSHA accident investigation.

Remember, at the request of OSHA, the employer must mark for identification, materials, tools or equipment necessary to the proper investigation of an accident. It is important that material evidence does not somehow get lost or "walk off" the scene.

**Two things may disappear after an accident occurs**

**Material evidence.** Material evidence is anything that might be important in helping us find out what happened. Somehow, tools, equipment, and other items just seem to move. The employer is anxious to "clean up" the accident scene so that people can get back to work. It's important to develop a procedure to protect material evidence so that it does not get moved or disappear. If evidence disappears, I'm sure you can see why it might be difficult to uncover the surface causes for the accident. If you can't uncover the surface causes, it will be almost impossible to discover and correct the root causes. We'll talk more about surface and root causes later in the course.

**Memory.** Accidents are traumatic events that result in both physical and psychological trauma. Of course, there may be physical trauma to the victim and others. Varying degrees of psychological trauma may also result depending on how "close" an individual is to the accident or victim. Everyone is affected somehow. As the length of time after an accident increases, thoughts and emotions distort what people believe they saw and heard. Conversations with others further distort reality. After a while, the memory of everyone associated in any way with the accident will be altered in some way. With that in mind, it's important to get written statements and conduct interviews as soon as possible.

**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.

Let's take a look at the OSHA Standard 29 CFR 1904.39, Reporting fatalities, hospitalizations, amputations, and losses of an eye as a result of work-related incidents to OSHA, for the specific requirements.

**Basic requirement**

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.

You must report the fatality, in-patient hospitalization, amputation, or loss of an eye using one of the following methods:

- By telephone or in person to the OSHA Area Office that is nearest to the site of the incident.
- By telephone to the OSHA toll-free central telephone number, 1-800-321-OSHA (1-800-321-6742).
- By electronic submission using the reporting application located on OSHA's public website.

Implementation

If the Area Office is closed, may I report the incident by leaving a message on OSHA's answering machine, faxing the area office, or sending an e-mail?

No, if you can't talk to a person at the Area Office, you must report the event using the 800 number.

What information do I need to give to OSHA about the incident?

You must give OSHA the following information for each fatality, in-patient hospitalization, amputation, or loss of an eye:

- the establishment name;
- the location of the work-related incident;
- the time of the work-related incident;
- the type of reportable event (i.e., fatality, in-patient hospitalization, amputation, or loss of an eye);
- the number of employees who suffered a fatality, in-patient hospitalization, amputation, or loss of an eye;
- the names of the employees who suffered a fatality, in-patient hospitalization, amputation, or loss of an eye;
- your contact person and his or her phone number; and
- a brief description of the work-related incident.

Do I have to report a motor vehicle accident?
No, you do not have to report the accident if it occurred on a public street or highway. Yes, if it occurred in a construction work zone.

**Do I have to report an event that occurs on a commercial or public transportation system?**

No, if it occurred on a commercial airplane, train, subway or bus accident. However, these injuries must be recorded on your OSHA injury and illness records, if you are required to keep such records.

**Do I have to report a fatality caused by a heart attack at work?**

Yes, your local OSHA Area Office director will decide whether to investigate the incident, depending on the circumstances of the heart attack.

**Do I have to report a fatality, in-patient hospitalization, amputation, or loss of an eye that does not occur during or right after the work-related incident?**

No, you must only report a fatality to OSHA if the fatality occurs within thirty (30) days of the work-related incident. For an in-patient hospitalization, amputation, or loss of an eye, you must only report the event to OSHA if it occurs within twenty-four (24) hours of the work-related incident. However, the fatality, in-patient hospitalization, amputation, or loss of an eye must be recorded on your OSHA injury and illness records, if you are required to keep such records.

**What if I don’t learn about a reportable fatality, in-patient hospitalization, amputation, or loss of an eye right away?**

If you do not learn about a reportable fatality, in-patient hospitalization, amputation, or loss of an eye at the time it takes place, you must make the report to OSHA within the following time period after the fatality, in-patient hospitalization, amputation, or loss of an eye is reported to you or to any of your agent(s): Eight (8) hours for a fatality, and twenty-four (24) hours for an in-patient hospitalization, an amputation, or a loss of an eye.

**How does OSHA define “in-patient hospitalization”?**

OSHA defines inpatient hospitalization as a formal admission to the in-patient service of a hospital or clinic for care or treatment.

**Do I have to report an in-patient hospitalization that involves only observation or diagnostic testing?**

No, you do not have to report an in-patient hospitalization that involves only observation or diagnostic testing. You must only report to OSHA each inpatient hospitalization that involves care or treatment.
How does OSHA define “amputation”?

An amputation is the traumatic loss of a limb or other external body part. Amputations include a part, such as a limb or appendage, that has been severed, cut off, amputated (either completely or partially); fingertip amputations with or without bone loss; medical amputations resulting from irreparable damage; amputations of body parts that have since been reattached. Amputations do not include avulsions, enucleations, deglovings, scalpings, severed ears, or broken or chipped teeth.
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. The purpose of an accident investigation includes all of the following, except _____.
   a. Uncover surface and root causes
   b. Improve safety in design
   c. Determine fault
   d. Make safety program improvements

2. Which of the following are methods used to secure the accident scene?
   a. Use yellow caution tape
   b. Place cones
   c. Post a guard
   d. Any of the above may be used

3. What might be the result if the investigation is not initiated as soon as possible?
   a. Memory about what happens disappears
   b. Material evidence is moved or removed
   c. More difficult to uncover the facts
   d. All of the above might result

4. If a workplace fatality occurs, the affected employer must notify OSHA within _____ hrs.
   a. 24
   b. 16
   c. 8
   d. 4
5. The fatality report to OSHA would include all of the following except _____.

   a. Name of witness(s)
   b. Name of the establishment
   c. Location of incident
   d. Contact person
   e. Description of the incident

Go online and submit your quiz to receive the correct “book” answers.
Module 3: Documenting the Accident Scene

Document before it goes away...

In this module we will take a look at strategies for documenting the accident scene. We'll emphasize the team approach and discuss the advantages of using the various documentation methods including, personal observation, photo/videotaping, taking statements, drawing sketches and reviewing records.

Why the team approach works best

Once the accident scene has been roped off, it's important to begin immediately to gather evidence from as many sources as possible during an investigation. One of the biggest challenges you'll face as an investigator is to determine what information is relevant. You want data that will help you determine what happened, how it happened, and why it happened. Identifying items that answer these questions is the purpose of documenting the accident scene.

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 not 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. All items found at the scene should be considered important and potentially relevant material evidence. Consequently, a team approach is probably the most efficient strategy to use when investigating serious accidents.

Methods to document the accident scene

Let's talk about the various methods you can use to document the accident scene.
Make personal observations

With clipboard in hand, take notes on personal observations. Try to involve all of your senses (sight, hearing, smell, etc.).

- What do you see? What equipment, tools, materials, machines, structures appear to be broken, damaged, struck or otherwise involved in the event? Look for gouges, scratches, dents, smears. If vehicles are involved, check for tracks and skid marks. Look for irregularities on surfaces. Are there any fluid spills, stains, contaminated materials or debris?
- What about the environment? Were there any distractions, adverse conditions caused by weather? Record the time of day, location, lighting conditions, etc. Note the terrain (flat, rough, etc.).
- What is the activity occurring around the accident scene?
- Who is there: Who is not? You'll need this information to take initial statements and interviews.
- Measure distances and positions of anything and everything you believe to be of any value to the investigation.

Get initial statements

If you are fortunate there will be one or more eye-witnesses to the accident. Ask them for an initial statement giving a description of the accident. Also try to obtain other information from the witness including:

- names of other possible witnesses for subsequent interviews;
- names of company rescuers or emergency response service; and
- materials, equipment, articles that may have been moved or disturbed during the rescue.

Take photos of the accident scene

When taking photos, make sure you start with distance shots, and gradually move in closer as you take the photos. Below are some important points to remember about taking photos.

- Take photos at different angles (from above, 360 deg. of scene, left, right, rear) to show the relationship of objects and minute and/or transient details such as ends of broken rope, defective tools, drugs, wet areas, containers.
- Take panoramic photos to help present the entire scene, top to bottom - side to side.
• Take notes on each photo. These will be included in the appendix of the report along with the photos. Identify the type of photo, date, time, location, subject, weather conditions, measurements, etc.
• Place an item of known dimensions in the photo if hard-to-measure objects are being photographed.
• Identify the person taking the photos.
• You may want to indicate the locations at which photos were taken on sketches.

Take video clips of the scene

There is no requirement to take video. However, with the video capability of digital cameras, it's becoming more common to use this method. If you are planning to take video, the earlier you can begin the better. Once the emergency responders are attending to the victim, begin taking video. The video recorder will pick up details and conversations that can add much valuable information to your investigation. Just remember not to get in the way. Below are some important points to remember when videotaping.

• Have each witness accompany you and privately describe what happened while taking video.
• If possible, try to reenact the event.
• To get the "lay of the land," stand back from a distance and zoom in to the scene.
• Scan slowly 360 degrees left and right to establish location.
• Narrate what is being viewed: describe objects, size, direction, and location, etc.
• If a vehicle was involved, video the direction of travel, going and coming.

Before you take video, make sure your video camera is operating properly, the battery is charged, and, oh yes...take the cap off the lens ;-) 

Sketch the accident scene

Sketches are very important because they complement 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. Below you will find the basic components of a sketch.

• Documentation. Date, time, location, identity of objects, victims, etc.
• Spatial relationships. Measurements.
• Location of photographs.
Sketches are also valuable because they reconstruct the accident in model form and effectively show movement through time. Sketches also help establish testimony if it becomes necessary to defend against a damage or injury claim. The sketch may also help establish a claim against a supplier or manufacturer.

You don’t have to be a professional illustrator to make a decent sketch, but you must be accurate in your measurements. Take a look at the sketch below as a sample of a useful sketch.

**Some sketching pointers**

- Make sketches large; preferably 8” x 10”.
- Makes sketches clear. Include information pertinent to the investigation.
- Include measurements. Establish precise fixed identifiable reference points.
- Print legibly. All printing should be on the same plane.
- Indicate directions: N,E,S,W.
- Always tie measurements to a permanent point, e.g. telephone pole, building.
- Mark where people were standing.
- Use an arrow to show direction of motion
- Use sketches when interviewing people.
- Show where photos were taken.
The first sketch to the right illustrates the Triangulation Method which makes it possible to later pinpoint the exact location of an object. In this accident, the victim contacted a high voltage line with a metal tree trimming pole. The position of the victim’s head is measured from three points. 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.

The second sketch illustrates one of the major advantages of sketching. It shows motion through time. In this sketch you can see the direction the deceased and the bulldozer were travelling shortly before the accident and at the time of the accident.
Interview records

That's right...you don't just review records, you "interview" them by asking them questions. If you ask...they will answer. Below are some of the records you may want to interview.

- Maintenance records
- Training records
- Standard operating procedures
- Safety policies, plans, and rules
- Work schedules
- Personnel records
- Disciplinary records
- Medical records (if permission granted, or otherwise allowed.)
- EMT reports
- OSHA 300 Log
- OSHA Form 301, Injury and Illness Incident Report
- Safety committee minutes
- Coroner's report
- Police report

Documenting the scene is important for so many reasons. Remember, the team approach works best because accuracy in reconstructing the accident is the final criteria. I think you'll agree that given all the time and money constraints, and complexity of the investigation process, two heads are better than one. Now let's take the quiz.
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. When documenting the scene, one of the biggest challenges facing the investigator is to determine...
   a. determine who is to blame
   b. determine what’s relevant
   c. determine who's in charge
   d. determine who is liable

2. The most effective documentation strategy is to...
   a. document material evidence
   b. document obviously relevant material
   c. document it, even if relevancy is in question
   d. document evidence to establish relevancy

3. When making personal observations, the investigator should consider which of the following:
   a. What is not present
   b. Condition of objects
   c. What is present
   d. All of the above

4. Photos are better at documenting the scene for all the reasons below except:
   a. Photos more effectively show motion through time.
   b. Photos are better at displaying details.
   c. Photos best show size relationships.
   d. Photos are easier to produce.
5. Which of the documents below is least likely to be "interviewed" as part of the investigation process for a minor injury?

   a. Training records
   b. Maintenance records
   c. Police records
   d. Inspection records

Go online and submit your quiz to receive the correct “book” answers.
Module 4: Conducting Effective Interviews

Digging up the facts can be a challenge

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. This module will help you understand how to set up an interview and develop interview questions. The module will also discuss how to organize the interview and the participants to most effectively get accurate information.

Steve's Seven "Rights" of the interview process

The purpose of the accident investigation interview is to obtain an accurate and comprehensive picture of what happened. To do that, the interviewer must demonstrate personal leadership and skill in conducting the interview. Since leadership is all about doing the right thing, I came up with seven "rights" to help us remember what we should do to make sure the interview process is effective. So, here are those seven rights...

Be sure you ask the...

1. Right people the
2. Right questions at the
3. Right time in the
4. Right place in the
5. Right way for the
6. Right reason to uncover the
7. Right facts

Cooperation is the Key!

Cooperation not intimidation is the key to a successful accident investigation interview. It's very counterproductive to give the impression in any way that can be interpreted by the interviewee as trying to establish blame. The purpose of the accident interview is to uncover additional information about the hazardous conditions, unsafe work practices, and related system weaknesses that contributed to the accident. Consequently, it's very important that effective techniques to establish trust and a cooperative atmosphere be used by the interviewer during the process.
What are effective ways to increase cooperation in the accident interview process? What communication strategies might increase the likelihood of an adversarial relationship in the interview? As you conduct interviews, gaining experience along the way, you'll further develop the "art" of interviewing by improving your ability to apply these techniques.

Preparing for the interview

Your first task is to determine who needs to be interviewed. You will need to design your questions around the interviewee. Consequently, each interview will be a very unique experience. Interviews should occur as soon as possible, but usually they do not happen until things have settled down just a bit. Below are some of the people you may want to consider interviewing.

- **The victim.** To determine the immediate events leading up to and including the accident.
- **Co-workers.** To establish what actual vs. appropriate procedures are being used.
- **Direct supervisor.** To get background information on the victim. He or she can provide procedural information about the task that was being performed, the training provided, workload, scheduling, and resources being provided.
- **Manager.** To get information on related operational and safety management programs/systems.
- **Training department.** To get information on quantity and quality of training the victim and others have received.
- **Personnel department.** To get information on the victim's and other employees' work history, discipline, appraisals.
- **Maintenance personnel.** To determine background on corrective and preventive maintenance.
- **Emergency responders.** To learn what they saw and did when responding to the accident.
- **Medical personnel.** To get medical information (as allowed by law.)
- **Coroner.** Can be a valuable source to determine type/extent of fatal injuries.
- **Police.** If they filed a report.
- **Other interested persons.** Anyone interested in the accident may be a valuable source of information.
- **The victim's spouse and family.** They may have insight into the victim's state of mind or other work issues.
Effective Interviewing Techniques

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. To do that, you will need to understand effective interview techniques and be able to skillfully apply those techniques.

It's important to remember that you are conducting an accident investigation, not a criminal investigation. These two interview processes may be similar, but each has a unique purpose. Each process requires different techniques to achieve the intended purpose. The last thing you want to do in an accident investigation 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 to the facts...not find fault.

- Keep the purpose of the investigation in mind: To determine the cause of the accident so that similar accidents will not recur. The interview process is not conducted to determine liability, but to determine the facts so that any and all safety management system design and implementation weaknesses can be improved. Make sure the interviewee understands this: "We don't want you or anyone else to get hurt like this again."
- First, ask for background information like name, job, and phone number. 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.
- Approach the investigation with an open mind. It will be obvious if you have preconceptions about the individuals or the facts.
- Go to the scene. Just because you are familiar with the location or the victim's job, don't assume that things are always the same. If you can't conduct a private interview at the location, 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.
- Tell the interviewee that the information they give is important. It's important to say it's "important".
- 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 to clarify particular areas or get specifics. Try to avoid closed-ended questions that require a simple yes and no answer. Try to avoid asking
"why-you" questions as these type of questions tend to make people respond defensively. Example: Do not ask: "Why did you drive the forklift with under-inflated tires? Rather, ask: What are forklift inspection procedures? or "Tell me about the forklift inspection procedure."

- Repeat the facts and sequence of events back to the person to avoid any misunderstandings.
- Notes should be taken very carefully, and as casually as possible. Let the individual read your notes so that they can possibly fill in missing information and correct inaccuracies. Give the interviewee a copy of the notes. Have the interviewee initial that they have read and found the notes accurate.
- Don’t use a tape recorder unless you get permission. Tell the interviewee that the purpose of the recorder is to make sure the information is accurate. Offer to give the interviewee a copy of the tape.
- If the interviewee wants to have someone witness the interview, that’s fine. In most union environments, this is an employee right.
- Ask for the interviewee’s opinion about what caused the accident and what can be done to make sure it doesn’t happen again. Do not accept answers that accuse or place blame. Note: There is never enough information to establish blame at this phase of the investigation. Only after the investigation is complete and closed out will the need for discipline be discussed, and that’s usually the responsibility of the supervisor and the Human Resource Department, not the accident investigator.
- Conclude the interview with a statement of appreciation for their contribution. Ask them to contact you if they think of anything else. If possible, relay the outcome of the investigation to each person who was interviewed. Again, do not discuss the possibility of disciplinary action.

Understanding and applying the information above during the interview process will help establish a high level of trust and a cooperative relationship so that you can get to the facts. Remember, intimidation and placing blame has no place in the accident investigation process and besides, it just doesn’t work.

Okay, now that you are an ace interviewer, it’s time to take the module quiz ;-)
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. **What is the purpose of the interview process.**
   a. satisfy OSHA investigation requirements
   b. determine who is to blame quickly
   c. determine the cause of the accident
   d. cover your rear end

2. **Which of the following is an effective interview technique?**
   a. Ask "why-you" questions
   b. Ask open-ended questions
   c. Blow smoke in their face
   d. Encourage fault-finding

3. **Which of the following locations might be best for conducting the interview?**
   a. The scene of the accident
   b. The supervisor's office
   c. The lunch room
   d. At a restaurant

4. **Why is it important to ask the interviewee to review the interview notes?**
   a. to keep them confidential
   b. to shape interviewee thinking
   c. they can make sure the right person is blamed
   d. they can correct inaccuracies
5. What happens when you interview several persons in presence of each other?

a. the others' stories change with each interviewee's account  
b. others will remember more with each interview  
c. each interviewee will more likely be accurate with each story  
d. each interviewee feels more comfortable telling their story

Go online and submit your quiz to receive the correct “book” answers.
Module 5: Conducting Event Analysis

Introduction

This module introduces you to the concepts of assessment and analysis as they relate to the accident investigation process. We'll review some theories of accident causation and discuss the process of developing and analyzing the sequence of events occurring prior to, during, and immediately after an accident.

Sorting it all out...

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. 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 behaviors and conditions, and the underlying 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."

When an accident occurs, we need to separate or "break down" the "whole" accident process into its component "parts" for study to determine how they relate to the whole accident. Since the accident, itself, is the main event, its component parts may be thought of as the individual events leading up to and including the main event or the accident. 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.

Why accidents happen

Over the past century, safety professionals have tried to more effectively explain how and why accidents occur. During the early years the initial explanations were at first rather simplistic. Theorists gradually realized that it was not sufficient to explain away workplace accidents as simple cause-effect events. They developed new theories that better explained as the result of
complicated interactions taking place among conditions, behaviors and systems. With this in mind, let's take a look at some of these theories.

**Single Event Theory**

"Common sense" leads us to this explanation. An accident is thought to be the result of a single, one-time easily identifiable, unusual, unexpected occurrence that results in injury or illness. Some still believe this explanation to be adequate. It's convenient to simply blame the victim when an accident occurs. For instance, if a worker cuts her hand on a sharp edge of a work surface, her lack of attentiveness may be explained as the cause of the accident. **ALL** responsibility for the accident is placed squarely on the shoulders of the employee. An accident investigator who has adopted this explanation for accidents will never look beyond perceived personal employee flaws to discover the underlying system weaknesses that may have contributed to the accident.

**The Domino Theory**

This explanation describes an accident as a series of related occurrences which lead to a final event which results in injury or illness. Like dominoes, stacked in a row, the first domino falling sets off a chain reaction of related events that result in an injury or illness. The accident investigator will assume that by eliminating any one of those actions or events, the chain will be broken and the future accident prevented. In the example above, the investigator may recommend removing the sharp edge of the work surface (an engineering control) to prevent any future injuries. This explanation still ignores important underlying system weaknesses or root causes for accidents.

**Multiple Cause Theory**

This explanation takes us beyond the rather simplistic assumptions of the single event and domino theories. Once again, accidents are not assumed to be simple events. They are the result of a series of **random** related or unrelated actions that somehow interact to cause the accident. Unlike the domino theory, the investigator realizes that eliminating one of the events does not assure prevention of future accidents. Removing the sharp edge of a work surface does not guarantee a similar injury will be prevented at the same or other workstation. Many other factors may have contributed to an injury. An accident investigation will not only recommend corrective actions to remove the sharp surface, it will also address the underlying system weaknesses that caused it.
In the multiple-cause approach to accident investigation, many events may occur, each somehow contributing to the final event. For instance, if a supervisor ignores an unsafe behavior because doing so is not thought to be his or her responsibility, the failure to enforce safe behavior represents an event in the production process that may contribute to or increase the probability of a future accident.

**The final event in an unplanned process**

When we understand that the accident, itself, is actually the final event in a complex series of events, we'll naturally want to know what the initiating events were. When the initiating events occur, they effect, in one way or another, the workplace conditions and actions of others, setting in motion a potentially very complicated process that eventually ends in an injury or illness. The trick 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.

**Developing the sequence of events**

Our challenge at this point in the investigation process is to accurately determine the sequence of events 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 elements 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.

(Hold on... we'll study more about these three elements in the next module.)
Four categories of events

In this step, take the information you have gathered to determine the events prior to, during, and after the near miss/injury accident. It is important to note that a serious injury accident can easily be the result of 20 or more events. Events can occur anytime, anywhere, any place, and to anyone. It is possible that pertinent events may have occurred many weeks or months before the accident.

There are four categories of events:

1. **Actual Events.** These are events that you are able to determine actually occurred i.e., an event that is witnessed by one or more persons (two or more is best) and they can verify it actually happened. You would want to interview all witnesses to the event.

   Example: Bob and Bobbie saw Robert turn off the chipper power switch and then walk over and reach into the chipper in an attempt to remove some jammed wood.

2. **Assumed Events.** These are events that must have happened but have not yet been verified. Flag these somehow to remind you that more investigation is needed. Assumed events are harder to establish. In any step-by-step process, you can't get to step 3 without first doing the first two steps. If a worker is injured at step 3, you may assume he accomplished steps 1 and 2 unless, it is established that he bypassed the first two steps. If completing steps 1 and 2 will prevent an injury at step 3, you may assume the worker did not do steps 1 or 2.

   Example: If Robert's hand was crushed while clearing a piece of wood that was stuck in a large chipper, we may assume he did not perform lockout/tagout, or we may assume that he performed lockout/tagout incorrectly. Only further investigation and analysis will uncover what actually happened.

3. **Non-Events.** If an event was supposed to happen, but did not, that is a non-event. Although non-events describe an event that did not occur, they should be captured because they may help discover conditions and behaviors relevant to the investigation.

   Example: Robert did not try to start the chipper to verify lockout/tagout was successfully performed. He failed to perform the verification step of the lockout/tagout procedure.
4. **Simultaneous Events.** In some accidents scenarios two or more events occur at precisely the same time resulting in a hazardous condition or set of unsafe behaviors that cause an injury.

   Example: Ralph wondered why the chipper was off and turned it back on at the same instant in time that Robert reached into the chipper to remove the jammed wood.

**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.

- **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.

- **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 this example, "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 voice.

**Sample sequence of events**

To get a good idea of what the sequence of events looks like, review the example below that was prepared for an actual fatality investigation conducted by an OSHA accident investigator a few years ago.
1. Employee #1 returned to work at 12:30 PM after lunch to continue laying irrigation pipes.

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

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

4. Employee #2 heard a ‘zap’ and turned to see the mainline pipe falling and employee #1 falling into an irrigation ditch.

5. Employee #2 ran to employee #1 and pulled him from the irrigation ditch, laid him on his back and ran about 600 ft to his truck and placed a call for help on his mobile phone.

6. Employee #2 then ran back to find employee #1 had fallen back into the ditch.

7. Employee #2 jumped back into the ditch and held employee #1 out of the water until help arrived.

8. Two other ranch employees arrived and assisted employee #2 in getting employee #1 out of the ditch.

9. Approximately one minute later, paramedics arrived and began to administer CPR on employee #1. They also used a heart defibrillation machine in an attempt to stabilize employee #1’s heart beat.

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

Make sure you are constructing only one event

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:

1. Look around. Determine if anything else was said/done before or after the event you’re currently assessing.

2. 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.

**Paint a word picture**

It's important that the sequence of events clearly describe what occurred so that someone who is unfamiliar with an accident is able to "see it happen" as they read the narrative.

**Sample sequence of events**

Here is another example that shows how a sequence of events can be developed using cards. Describe each event and then arrange the events on your desk or a wall in the proper sequence.

**Final Words**

Well, that was a good introduction to the idea of constructing the sequence of events. Just remember, the accuracy of your investigation will be greater by following this procedure. Okay, that's it. It's time to take the quiz.
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. (fill in the blanks) _______________ determines presence/absence. _______________ breaks down the whole into parts to see how they each relate to the whole.
   a. Evaluation, Analysis
   b. Analysis, Assessment
   c. Assessment, Analysis
   d. Analysis, Evaluation

2. Once the sequence of events is developed, the investigator will study each event to determine all of the following, EXCEPT:
   a. hazardous conditions
   b. unsafe behaviors/actions
   c. system weaknesses
   d. personal fault

3. Which theory below states that eliminating one event does not assure prevention of future accidents?
   a. Single event theory
   b. Domino theory
   c. Multiple cause theory
   d. System weakness theory

4. In the event statement, "Robert pounded a nail with a broken hammer," ________ is the actor and ________ is the action.
   a. Broken hammer, pounded a nail
   b. Nail, with a broken hammer
   c. Robert, pounded a nail
   d. Robert, with a broken hammer
5. In this event statement, "The wrench struck Robert's hand," ________ is the actor and _________ is the action.

   a. struck, wrench
   b. struck, Robert
   c. Robert, struck
   d. wrench, struck

Go online and submit your quiz to receive the correct “book” answers.
Module 6: Cause Analysis

Introduction

You've completed the initial 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 the three phases of analysis below:

- Injury Analysis to determine the direct cause of injury
- Event Analysis to determine the surface causes of the accident
- System Analysis to determine the root causes of the accident

Three Phases of Cause Analysis

As mentioned earlier in the course, accidents are processes that culminate in an injury or illness. An accident may be the result of many factors (simultaneous, interconnected, cross-linked events) that have interacted in some dynamic way. In an effective accident investigation, the investigator will conduct three levels of cause analysis:

**Injury analysis:** At this level of analysis, we do not attempt to determine what caused the accident, but rather we focus on trying to determine how harmful energy transfer caused the injury. Remember, the outcome of the accident process is an injury.

**Surface Cause Analysis:** Here you determine the hazardous conditions and unsafe behaviors described in the sequence of events that dynamically 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.

**Root cause analysis:** At this level, you're analyzing the weaknesses in the safety management system 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. 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.

I think the greatest challenge to effective accident investigation is to transition from event analysis to systems analysis.
One last important point to make is that most accident processes are far more complex than you might originally think. Some experts believe at least 10 or more factors come together to cause a serious injury accident. Other experts state that an average of 27 factors directly and indirectly contribute to a serious accident.

Only by thoroughly conducting all three levels of analysis can you design system improvements that effectively eliminate hazardous conditions and unsafe behaviors at all levels of the organization. The accident investigation cannot serve as a proactive safety process unless system improvements effectively prevent future accidents.

**Injury Analysis**

It's important to understand that 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 that 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.
Injuries always somehow result in the transfer of a harmful level of energy to a person's body. The severity of the injury depends on the magnitude of the harmful energy. Below are the various forms of energy that can be harmful.

**Harmful Forms of Energy**

1. **ACOUSTIC ENERGY** - Excessive noise and vibration.
2. **CHEMICAL ENERGY** - Corrosive, toxic, flammable, or reactive substances. Involves a release of energy ranging from "not violent" to "explosive" and "capable of detonation."
3. **ELECTRICAL ENERGY** - Low voltage (below 440 volts) and high voltage (above 440 volts).
4. **KINETIC (IMPACT) ENERGY** - Energy from "things in motion" and "impact," and are associated with the collision of objects in relative motion to each other. Includes impact between moving objects, moving object against a stationary object, falling objects or persons, flying objects, and flying particles. Also involves movement resulting from hazards of high pressure pneumatic, hydraulic systems.
5. **MECHANICAL ENERGY** - Cut, crush, bend, shear, pinch, wrap, pull, and puncture. Such hazards are associated with components that move in circular, transverse (single direction), or reciprocating motion.
6. **POTENTIAL (STORED) ENERGY** - Involves "stored energy." Includes objects that are under pressure, tension, or compression; or objects that attract or repulse one another. Susceptible to sudden unexpected movement. Includes gravity - potential falling objects, potential falls of persons. Includes forces transferred biomechanically to the human body during lifting.
7. **RADIANT ENERGY** - Relatively short wavelength energy forms within the electromagnetic spectrum. Includes infra-red, visible, microwave, ultra-violet, x-ray, and ionizing radiation.
8. **THERMAL ENERGY** - Excessive heat, extreme cold, sources of flame ignition, flame propagation, and heat related explosions.

**Event 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 to find hazardous conditions and unsafe actions.*
conduct an event analysis 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.

**Hazardous Conditions**

- Are unique things or objects that are somehow defective or unsafe
- Are "states of being" such as employee fatigue
- May also be unique defects in processes, procedures or practices
- May exist at any level of the organization
- Are the result of deeper root causes

Hazardous conditions may exist in any of the categories below.

- Materials
- Machinery
- Equipment
- Tools
- Chemicals
- Environment
- Workstations
- Facilities
- People
- Workload

**Unsafe or Inappropriate Behaviors**

It's important to know that most hazardous conditions in the workplace are the result of the unsafe or inappropriate behaviors that produced them.

- Actions we take or don't take that increase risk of injury or illness
- May also be thought to be unique performance errors in a process, procedure or practice
- May exist at any level of the organization
- Are the result of deeper root causes

Below are some examples of unsafe or inappropriate employee/manager behaviors.

- Failing to comply with rules
- Using unsafe methods
- Taking shortcuts
- Horseplay
- Allowing unsafe behaviors
- Failing to train
- Failing to supervise
- Failing to correct
• Failing to report injuries
• Failing to report hazards
• Scheduling too much work
• Ignoring worker stress

Analysis Tools

We recommend using both the "5-Why Analysis" and "Fishbone Diagram" to help you conduct an event analysis to uncover surface causes. Follow the steps below to conduct a Fishbone Diagram:

1. Get a sheet of paper.
2. At the top of the sheet write "Accident Analysis". Doing this reminds you that you are breaking down the process into a number of events.
3. At the left side of the sheet, centered, write "The Injury".
4. Extend a horizontal line out from the right of the box.
5. Describe the injury event on the horizontal line.
6. Identify and circle the actors and actions described in the event statement.
7. Start asking **why** questions (at least five) about the condition of actors and actions to uncover hazardous conditions or unsafe behaviors.
8. Draw lines either angling up or down from the circled actors and actions and write the answers to your questions.
9. Repeat these steps with each of the new level of answers.

The diagram you'll produce using this procedure should look something like the diagram to the right. In fact, it will probably look more complex. Each level of questioning will get you closer to the root cause(s) that contributed to the hazardous conditions or unsafe behaviors. Ultimately, you'll start identifying inadequate policies, programs, plans, processes, procedures and practices (the 6P's): you're getting to the real root causes!

System Analysis

Now let's switch gears. Instead of talking about unique conditions and behaviors, let's take a look at analyzing the surface causes to determine possible safety management system weaknesses. There are many "general" conditions and behaviors (variables) inherent in the safety management system. Oh yes... to me the safety management system is "organic". By that I mean it is dynamic, ever-changing and behaves as though it were alive. Think about it. If that's a little too metaphysical for you... read on.

The **root causes** for accidents are the **underlying safety management system weaknesses**, which consist of thousands of variables, any number of which can somehow contribute to the surface causes of accidents. These weaknesses can take two forms.
• **System 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 (remember this as the 6-P’s) is very important to make sure appropriate conditions, activities, behaviors, and practices occur consistently throughout the workplace. Ultimately, most surface causes will lead to system design flaws.

• **System Implementation Root Causes:** Inadequate implementation of one or more components of the safety management system. After each safety management system component is designed, it must be effectively implemented. You may design an effective safety plan, yet suffer failure because it wasn't implemented properly. If you effectively implement a poorly written safety plan, you'll get the same results. In either instance, you'll eventually need to improve one or more policies, plans, programs, processes, procedures or practices.

Safety managers should work with safety engineers to eliminate or reduce exposure to hazards through effectively improving safety system components. Because systems design work common throughout the workplace, eliminating any single root cause may simultaneously eliminate many hazardous conditions and unsafe behaviors.

Since root causes reside within safety management systems, upper management -- those who formulate systems, are most likely going to be involved in making the necessary improvements. When analyzing for system weaknesses, it may be beneficial to coordinate closely with those who will be responsible for implementing system improvements.

If you have Adobe Acrobat, take a look at the Accident Weed, an excellent analogy that helps us understand the relationship between surface and root causes for accidents.

**Last Words**

Finally, according to SAIF Corporation in Oregon, most accidents in the workplace result from unsafe work behaviors.

- unsafe behaviors represent the primary surface cause for about 95% of all workplace accidents;
- hazardous conditions represent the primary surface cause for only about 3% of workplace accidents; and
- uncontrollable (unknowable) causes account for the remaining 2%.

These statistics imply that management system weaknesses contribute in some way for fully 98% (conditions + behaviors) of all workplace accidents. So, ultimately, most accidents are the result of safety management system weaknesses.
To effectively fulfill your responsibilities as an accident investigator, you must not close the investigation until these root causes and solutions have been identified.

Whew! That was a lot to take in. Time for the quiz!
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. Which of the following is a possible root cause contributing to an accident?
   a. The wrong tool
   b. A defective machine
   c. No safe work procedure
   d. A person

2. Which of the following is a surface cause for an accident?
   a. An inadequate policy
   b. A tired employee
   c. No written plan
   d. Unsafe process

3. Surface causes describe hazardous _________ and unsafe _________. Root causes describe inadequate _________.
   a. Systems, behaviors, conditions
   b. Behaviors, activities, policies
   c. Conditions, behaviors, systems
   d. Conditions, systems, accountability

4. The __________ of the injury depends on the __________ of the transfer of harmful energy.
   a. magnitude, probability
   b. probability, magnitude
   c. magnitude, severity
   d. severity, magnitude
5. Which of the following would be the form of hazardous energy transferred if an employee were to fall to a lower surface?

   a. kinetic  
   b. thermal  
   c. chemical  
   d. acoustic

Go online and submit your quiz to receive the correct “book” answers.
Module 7: Developing Solutions

What is a good recommendation?

An accident investigation is generally thought to be a "reactive" safety process because it is initiated only after an accident has occurred. However, if we propose recommendations that include effective immediate corrective actions and system improvements, we may transform the investigation into a valuable "proactive" process that helps to prevent future injuries. In this module we'll explore tips and tactics for making effective recommendations that "sell" safety improvements.

Once you have developed engineering and administrative controls to eliminate or reduce injuries, the challenge becomes convincing management to make changes. Management will most likely understand the importance of taking corrective action and readily agree to your ideas. However, if management doesn't quite understand the benefits, success becomes less likely. Your ability to present effective recommendations becomes all that more important. This module will help you learn how to put together "an offer they can't refuse," by emphasizing the long-term bottom-line benefits of the corrective action you are recommending.

Why decision-makers don't respond quickly

When recommendations are not acted upon, it is usually because the decision-maker does not have enough information to make a judgment. To speed up the process and to improve the approval rate, you must learn to anticipate the questions the decision-maker will ask in order to sign off on the requested change. This being the case, the more pertinent the information included in the presentation, the higher the odds are for approval.

Do it right!

It's important to divide your recommendations into the categories below.

- Immediate or short-term corrective actions to eliminate or reduce the hazardous conditions and/or unsafe behaviors related to the accident.
- 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.

**The Hierarchy of Control Strategies**

Let's discuss five hazard control strategies that you should to be familiar with. You can be sure they'll be on the exam :-)  

**Higher priority strategies that control hazards**

| 1. Elimination. | Totally eliminate the hazard. (no hazard - no accident) Why is this control strategy our top priority? Employing an engineering control has the potential to completely remove the hazard. We're somehow changing a thing/condition in the workplace. And as we all know...
|---|---
| **No hazard, no exposure = no accident.** |

| 2. Substitution. | Substitute the hazard with a less hazardous condition, process or method. Some basic examples are, substituting a toxic chemical with a non-toxic chemical, or replacing an old poorly-designed machine with a new model. |

| 3. Engineering controls. | See if any of the strategies below are used in your workplace. |
|---|---
| ▪ Design. Example - Design a tool so that it reduces the likelihood of a strain or sprain. |
| ▪ Redesign. Example - Change the design of a machine so that dangerous moving parts or electrical circuits are out of reach. |
| ▪ Enclosure. Examples - Place a hood over a noisy printer. Place a machine guard around a dangerous moving part. |

It's important to note that OSHA expects the employer to first try to eliminate, substitute or engineer the hazard so that it can no longer cause a serious injury. For instance, if a machine is producing unacceptable noise, OSHA would expect the employer to first eliminate or reduce the noise level to acceptable levels using one or more of these three strategies. In this instance, an engineering control such as enclosure might work.
Lower priority strategies to control exposure and behaviors

4. **Warnings**: Signs and labels that tell employees to "Keep Out," "May cause eye irritation" etc., are used to warn employees about hazards. Note: Employees do not necessarily follow "posted" rules and warnings. They usually only follow "enforced" rules and warnings. Think about that the next time you're driving down the highway. Do you drive at the posted speed limit, or the enforced speed limit? Enough said.

5. **Administrative controls**. This control strategy also attempts to reduce exposure by limiting the duration of exposure to a hazard. To do this, the employer may employ job rotation and schedule work/breaks. This is also accomplished through improving work procedures and practices. Example - Develop and use a safe work procedure for preventative maintenance on air conditioning equipment.

6. **Personal protective equipment (PPE)**. Some jobs require PPE by law. PPE places a barrier between workers and the hazard. This control strategy is used in conjunction with the other control strategies. It should not be used to replace them. When other controls do not adequately eliminate or reduce hazards, PPE may be needed in addition to those strategies. Remember, PPE does not eliminate or reduce the hazard itself, it merely sets up a barrier between you and the hazard. And, to be successful, it is highly dependent on the employee's behavior.

The final three control strategies are less effective than elimination, substitution, and engineering controls in the long term because they do not remove the hazard, itself. Rather, they merely attempt to reduce exposure to hazards by controlling behavior - attempting to change "things we do or don't do."

The final two control strategies are less effective than elimination, substitution, and engineering controls in the long term because they do not remove the hazard, itself. Rather, they merely attempt to reduce exposure to hazards by controlling behavior - attempting to change "things we do or don't do."

As long as employees "behave" or comply with the warning signs, administrative controls and wear PPE when required, these control strategies will work. However, human beings are natural risk-takers, and it's "normal" for us to want to work in the most efficient manner. Sometimes safe work procedures are not perceived as efficient, so we may not want to use them.
Therefore, managers must regularly supervise employees to make sure they comply with warning signs, procedures and PPE requirements. Think about the "Murphy's Law" principle below. It certainly applies to safety. Here's an important principle to remember:

"Any system that relies on human behavior is inherently unreliable."

The Hierarchy of Controls, when used separately or in combination, may be quite effective in eliminating or greatly reducing the probability of a future similar accident. However, to make sure long term risk reduction is achieved throughout the entire company, safety management system improvements must be made, so let's discuss this important topic.

**Recommend system improvements**

The surface causes for accidents actually represent the symptoms of underlying safety management system weaknesses. This cause-effect relationship is so important to understand that I'll say it again: the behaviors and conditions that caused the accident are, themselves, usually the effects of deeper root causes. This is a fact.

Consequently, your first assumption, as an accident investigator, should be that root causes have contributed to an accident, and your job is to find them. Your first basic assumption should never be that an accident is simply the result of surface causes. Once in a while, you'll find that an accident was solely the result of a "personal failure," but that won't be often: in fact, it will be rare in most organizations.

Therefore, make every effort to improve safety management system components to ensure long term workplace safety in your company. As we learned in the last module, the most successful accident investigator is actually a systems analyst. Making safety management system improvements might include some of the following examples:

- including "safety" in a mission statement;
- improving safety policy so that it clearly establishes responsibility and accountability;
- changing a work process so that checklists are used that include safety checks;
- including hands-on practice as part of the safety training program;
- revising purchasing policy to include safety considerations as well as cost; and
- changing the safety inspection process to include all supervisors and employees.
"GIGO" or "QIQO"?

Here's another idea to think about. When managers do not respond to a recommendation, it may be that they do not have enough useful information to take action. You've probably heard of the GIGO principle -- "If you put garbage in, you'll get garbage out." That also works on the flip side. Quality in - Quality out or "QIQO". Useful information presented to management is more likely to result in decisions that take effective action to make long-lasting positive improvement.

To develop great recommendations, ask six key questions

We're going to use this scenario to make some effective recommendations for corrective action. We want to make sure this accident never happens to Bob (or anyone else) again. You'll do this by reviewing the accident scenario and answering six key questions. With the information gained, you will conclude by writing a recommendation. Your job is to convince me (your supervisor) that your ideas make sense... and I'm busy, so make it good!

Bob was a new hire employee working as a clean up person in the finish department of XYZ, Inc's particle board plant. On his first day of work, he received an initial classroom orientation on company policies from the personnel department. He was also introduced to his new supervisor who gave him a walk-around tour of the plant. Since his supervisor was quite busy, and didn't have time to fully brief Bob on his new job, he was then given some simple initial duties to accomplish.

He was busy cleaning up around the floor under the return belt of a conveyor connected to a large piece of machinery. He removed a guard covering pinch points on the conveyor, and reached into the area to remove a piece of wood.

Bob's glove became caught in the return drum nip point, and he was drawn into the machinery. Luckily, Bob was eventually able to pull himself out of the machinery before being injured.

XYZ, Inc. has a mod rate of 1.5. Unfortunately, this incident was not a total surprise to the company. Most of their OSHA 300 Log recordable accidents have been the result of injuries to employees within their first six months on the job.

What's a mod rate? The experience modification rate (mod) compares an establishment’s workers’ compensation claims experience to other employers of similar size operating in the same type of business. The mod rate reflects a company's safety record and affects its insurance premium.

If the mod rate is higher than 1.0, the employer's experience is worse than expected and insurance premiums will be higher than the average for companies within the industry.
If the mod rate is below 1.0, the employer’s experience is better than expected and insurance premiums will be lower than average for companies in the industry.

Just remember, the company's safety goal is to achieve a mod rate below 1.0. For more information see NCCI - ABC's of Experience Rating.

Answer the following six questions to help develop and justify recommendations.

1. **What exactly is the problem?**
   - What are the specific hazardous conditions and unsafe work practices that caused the problem?
   - What are system components - the inadequate design or implementation of safety management programs, policies, plans, processes, procedures and general practices that allowed the conditions and behaviors to exist?

2. **What is the history of the problem?**
   Have similar accidents occurred previously? If so, you should be able to claim that the probability for similar accidents is highly likely to certain. What are previous direct and indirect costs for similar accidents? How have similar accidents affected production and morale?
   - Describe how it has affected direct, budgeted or insured costs related to past injuries or illnesses.
   - How has it affected indirect, unbudgeted or uninsured costs related to loss of efficiency and/or productivity and employee morale?

3. **What are the solutions that would correct the problem?**
   What are the specific engineering, administrative and PPE controls that, when applied, will eliminate or at least reduce exposure to the hazardous conditions? What are the specific system improvements needed to ensure a long term fix?

4. **Who is the decision-maker?**
   Who is the person who can approve, authorize, and act on the corrective measures? What are the possible objections that he/she might have? What are the arguments that will be most effective in overcoming objections?

5. **Why is the decision-maker doing safety?**
   It’s important to know what is motivating the decision-maker. Is the decision-maker doing safety to fulfill one or more of the following imperatives?
- **Fulfill the legal obligation?** You may need to emphasize possible penalties if corrections are not made. Common in a fear-driven culture.
- **Fulfill the fiscal obligation?** You may want to emphasize the costs/benefits. Common in an achievement-driven culture.
- **Fulfill the social obligation?** You may want to emphasize improved morale, public relations. Common in a humane corporate culture.

Employer motivation will determine the nature of the objections to the recommendations you submit. What are possible objections the decision-maker might raise? Whatever they might be, it's important you understand their motivations so that you are better prepared with responses that satisfy the decision-maker's needs.

- List the possible decision-maker objections.
- List the arguments that are most likely to be successful against those objections.
- As a last resort: Review employer obligations under administrative law.

6. **What will be the cost/benefits of corrective actions and system improvements?**

- What are the costs that might result if/when OSHA inspects? Answer this question to address the legal obligation your employer has.
- What is the estimated investment required to take corrective action, and how does that contrast with the possible costs if corrective actions are not taken? Answer this question to address the fiscal obligation your employer has.
- What is the "message" sent to the workforce and the community as a result of action or inaction? Answer this question to address the social obligation your employer has.

It's important to have the answers to all of these questions ready for the decision maker.

The maintenance supervisor may be able to help you estimate the investment required for recommended corrective actions.

More ideas to consider:

- These options must also eliminate or reduce the hazards and the exposures;
- Try to include at least three (real world) but only one or two for this exercise;
- Briefly list low/high cost solutions that eliminate the problem now/soon;
- Briefly list low/high cost solutions that reduce the problem now/soon;
- Briefly list the advantages and disadvantages of each solution.
Estimating direct and indirect costs

The direct and indirect accident costs represent the "benefits" (money saved) if we adopt the recommended actions. The benefits are realized because we will not have to pay the costs over the foreseeable future. To help estimate direct and indirect costs, you can use OSHA's Safety Pays software. This is an excellent software tool that determines 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.

What is the ratio between direct (insured) and indirect (uninsured) costs in your scenario?

The indirect costs for accidents will usually be higher than the direct costs. Indirect costs can range from 1 to 20 times greater than the direct costs, depending on the severity of the injury. For every $1 spent in direct costs, you’ll pay an additional $1 to $20 in indirect costs. To determine the ratio between the indirect and direct costs, use the following equation:

\[
\frac{\text{Indirect Costs}}{\text{Direct Costs}} = \text{___ to 1}
\]

Let's say an employee injured his hand (requiring surgery) while working around the machinery in our scenario. If the indirect (uninsured) accident cost totals $160,000 and the direct (insured) cost is $40,000, the ratio of indirect to direct costs will be 4 to 1. This ratio just happens to be the average ratio between indirect and direct accident costs in the USA.

What is the ratio between total accident costs to direct costs?

This ratio is a little more dramatic than contrasting the indirect costs with direct costs. It helps emphasize the fact that direct costs are actually just the tip of the iceberg. To determine this ratio, use the following equation:

\[
\frac{\text{Direct Costs} + \text{Indirect Costs}}{\text{Direct Costs}} = \text{___ to 1}
\]
In this case, if the indirect (uninsured) cost totals $160,000 and the direct (insured) cost is $40,000, the ratio of total costs to direct costs will be $200,000/$40,000 = 5:1. What will XYZ have to earn in sales to pay back this lost money? Well, if XYZ has a 5% profit margin, they'll have to earn 20X the total accident cost, or **$4 million in sales!!!**

**What is return on the investment (ROI)?**

To determine ROI, it's necessary to estimate the amount of the initial investment required to complete corrective actions and safety system improvements. Once the initial investment is determined, use the equation below to determine ROI.

\[
\text{ROI} = \left( \frac{\text{Total Accident Costs}}{\text{Total Investment}} \right) \times 100 \%
\]

Let's say our investment to train all employees on lockout/tagout procedures, machine guarding and PPE while working around machinery will be $20,000. If our total accident cost is $200,000, our ROI will be 1000%!!! Now that's a return.

**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:

- **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.
- **Second option** -- If we have limited funds, what would we do. Eliminate the hazard with primarily administrative controls. Engineering controls if required.
- **Third option** -- If we don't have any money, what can we do? Reduce exposure to the hazard with administrative controls and/or PPE.

Well, how was that? Pretty tough... but the whole idea is to help you get through the rough parts now, so that you will be able to develop and present an effective recommendation to top management the first time! It is time to take the review quiz, so let's go.
Module 7 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. When making recommendations, we need to propose immediate __________ actions and __________ improvements.
   a. retrieval, worker
   b. disciplinary, system
   c. system, behavioral
   d. corrective, system

2. Which of the following is an administrative control?
   a. Substitution
   b. Enclosure
   c. Rescheduling
   d. Redesign

3. Which hazard control strategy is considered most effective?
   a. Substitution
   b. Administrative Controls
   c. Elimination of the hazard
   d. Engineering controls

4. Which of the following is considered an immediate corrective action?
   a. Writing a new safety policy
   b. Establishing a proactive incentive program
   c. Placing a guard on a table saw
   d. Revising an accident investigation form

5. How does the "GIGO" principle apply to safety system improvements?
   a. Get in and get out (GIGO) before you get fired
   b. If you give management bad information, you'll get ineffective action
   c. Management GIGO is associated with negative entropy
   d. You're more likely to get top management support by eliminating GIGO
Go online and submit your quiz to receive the correct “book” answers.
Module 8: Writing the Report

Introduction

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. In this module, we'll cover the procedure for effectively reporting the facts.

Perception is reality...

Never forget that your primary objective, as an accident investigator, is to uncover the direct causal (surface causes) and contributory factors (root causes). It should not be your job to conduct the analysis to establish liability: that's playing OSHA if you do. In fact, if your analysis has uncovered any number of secondary surface causes or system weaknesses, justification for employee discipline does not exist because management has not fulfilled its accountabilities. Your challenge is to be as objective and accurate as possible.

Your findings, and how you present them, will shape perceptions and subsequent corrective actions. If your report arrives at conclusions such as..."Bob should have used common sense," or "Bobbie forgot to use PPE," how effective in making safety management system improvements will it be? Of course, it won't be effective at all. If your report concludes with statements like these, it will be virtually impossible to initiate corrective actions that permanently eliminate the causes. It's likely that similar accidents will recur. Bottom line: If the accident investigation doesn't fix the system, it's most likely been a waste of time and effort. Okay, I'll get off the soapbox. Let's look at the report.

Here is a series of Accident Reports with assessments of surface and root causes.

The Accident Report Form

One of the reasons an accident investigation might fail to help eliminate similar accidents, is that the report form is poorly designed. Some poorly designed forms actually make it quite difficult to get beyond identification of only surface causes: root causes are often ignored.

Let's take a look at one format that is designed to emphasize root cause analysis. If you have Adobe Acrobat, 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..

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 that 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.

Open Document

The accident investigation report should be considered an open document until all of the essential components have been completed. These include, but are not limited to:

- Background Information
- Accident Description
- Investigation Findings
  - Surface causes
  - Root causes
- Recommendations
  - Corrective actions
  - System improvements
- Report Summary
- Report Submitted
  - Safety committee
  - Decision-Maker
- Improvements Completed
  - Corrective actions
  - System improvements
Module 8 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. The primary purpose of the most effective accident investigation report is to...
   a. Determine negligence of the victim and/or others
   b. Improve safety management system weaknesses
   c. Comply with OSHA accident investigation requirements
   d. Fix hazards and correct behaviors

2. All of the following may be weaknesses in an accident report form, except?
   a. They may not give the investigator enough space to write findings
   b. They influence or force a determination of negligence
   c. They help guide the investigation process
   d. They report only surface findings

3. OSHA's accident investigation reports emphasize system improvement?
   a. True
   b. False

4. To be effective, an organization's accident investigation report must _________.
   a. accurately determine surface causes
   b. thoroughly describe the accident
   c. suggest system improvements
   d. accomplish all of the above

5. The accident investigation report should be considered an open document until _____.
   a. the report has been submitted to the appropriate decision-maker
   b. corrective actions have been completed.
   c. system improvements have been completed.
   d. all of the above is accomplished

Go online and submit your quiz to receive the correct “book” answers.